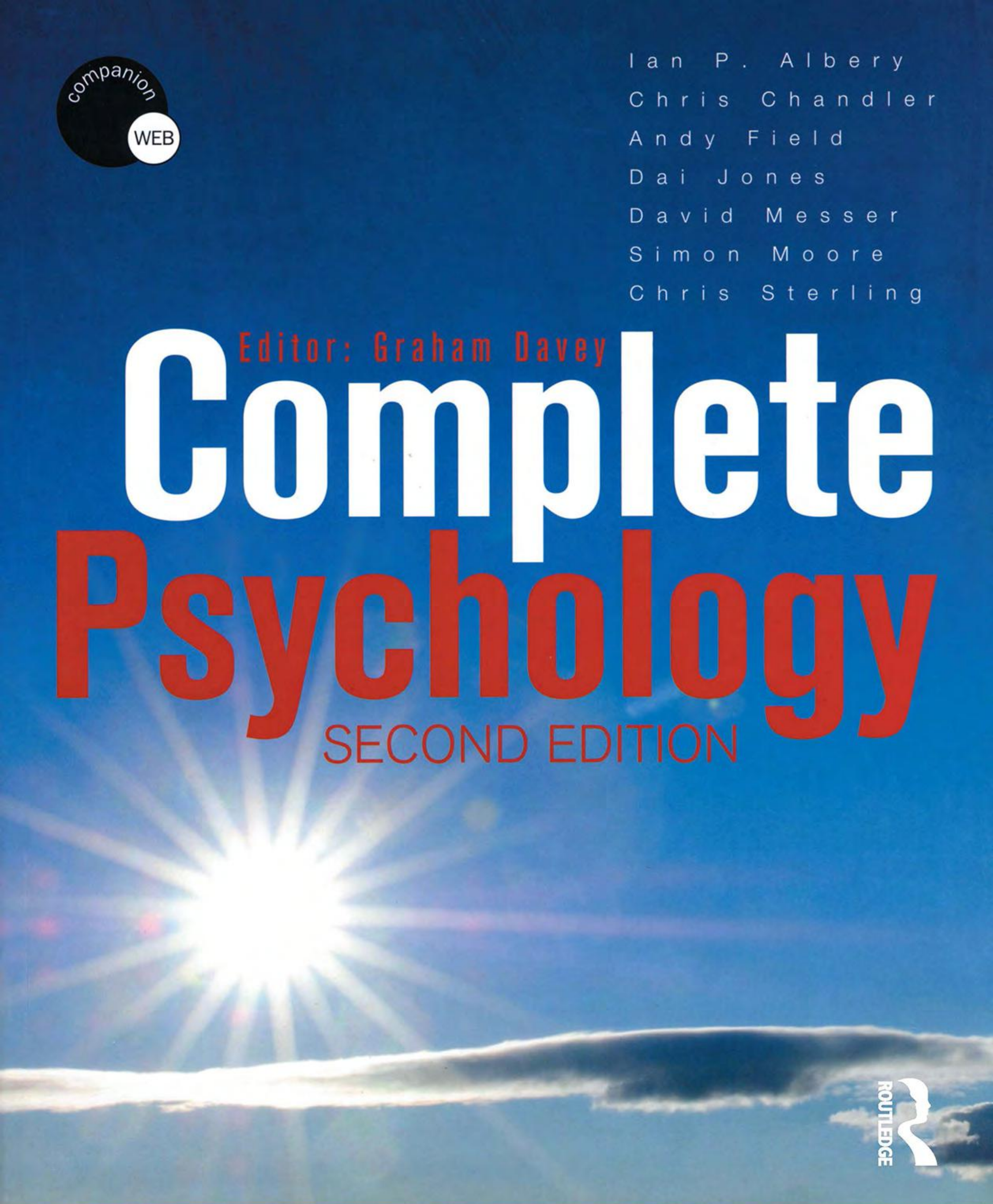

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Contents

Preface v
Acknowledgements vi
1 Introduction 1

Section 1

Conceptual and historical issues 4
2 Approaches to psychology 6
3 Psychology as science 20
4 Bias in psychology 32
5 Issues and debates in psychology 43

Section 2

Psychobiology 53
6 Introduction to psychobiology and genetics 54
7 The brain, neurons and nervous systems 71
8 Animal cognition and learning 100
9 Motivation, brain reward mechanisms and behaviour 115
10 Emotion and sleep 125
11 Perceptual systems and motor control 136

Section 3

Cognitive psychology 150
12 Perception 151
13 Attention 151
14 Memory 169
15 Language 204
16 Thinking and reasoning 218

Section 4

Developmental psychology 234
17 An introduction to developmental psychology 235
18 Cognitive development: thinking, information and representations 250
19 Communication, language and literacy 268
20 The self, others and social relationships 284

Section 5

Social psychology 301
21 Issues and themes in social psychology 302
22 Attitudes, persuasion and attitude change 315
23 Attribution 333
24 Impression formation and social interaction 345
25 Social influence and group processes 362

Section 6

Personality and intelligence 379
26 The psychology of emotion 380
27 Motivation 391
28 The self and social identity 403
29 Personality 412
30 Intelligence 437
31 Psychometric testing 453

Section 7

Psychopathology and health psychology 464
32 Basic issues in psychopathology 465
33 Psychopathology and its causes 478
34 Treating psychopathology 508
35 Health psychology 526

Section 8

Research methods and statistics 539
36 Why do we need research methods? 540
37 Collecting data 553
38 Summarising data 568
39 Going beyond your sample 586

Section 9

Careers and study skills 602
40 Being a psychologist 603
41 Study skills in psychology 612

Glossary 633
Appendix 664
References 668
Index 736

Preface to the second edition

Over the first 4 years of its existence, *Complete Psychology* has had a successful debut as a new and comprehensive text for students studying psychology. It has been adopted as a core recommended text in dozens of higher education institutions and has sold steadily from the book stands to anyone interested in expanding their knowledge of psychology.

While retaining all successful features of the first edition, this revision supplements the original syllabus and teaching and learning features with some additional materials. The syllabus content has been updated with references to new knowledge and recent research and the illustrative examples have been updated to give them a contemporary relevance. We have also included a number of new features that have been requested by teachers and instructors who have had a practical experience of using the book over the past 4 years. As well as a revised text, we have also given the book's website a facelift and upgrade. As well as offering links to other useful psychology-relevant sites and providing downloads of pdfs and PowerPoint presentations, the site also offers an expansive range of multiple choice questions (MCQs) covering all sections of the book. The MCQs can be accessed by teachers and instructors wishing to use them in their course assessments.

Features new to the second edition include:

- Provision of example generic essay titles at the end of each chapter together with a full list of supporting references that the student can source as an aid to writing their essay.
- Inclusion of self-test questions throughout each chapter so that the students can test their knowledge and retention of material as they read.
- The introduction of class activity boxes, which provide the teacher or instructor with a learning activity they can use with their lecture class or seminar group.
- Greater emphasis on examples of psychology in applied settings.
- A glossary of all the important terms and concepts that the student has been introduced to in this book. This will ensure that the student has a clear understanding of the basic terminology that is needed to pursue an academic career in psychology and this can be supplemented by the fuller descriptions and discussions of such terms that can be found in Hodder Arnold's *Encyclopaedic Dictionary of Psychology* (2005).

Finally, you will also notice that the text has been given a more contemporary design that should provide a more accessible learning experience and has also resulted in a book that is less bulky and cumbersome to carry around.

Graham Davey
November 2007

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Introduction

1

Introduction

What is psychology?

Psychology is about *people*. In particular, it is about why people do the things they do. It is also about *groups of people*. Why do people in the same group behave differently? Why are some people leaders and other people followers? Psychology is also about *helping people*. It enables us to develop treatments for psychological problems, put together effective health campaigns, facilitate education, help catch criminal offenders and increase productivity and health in the workplace. Psychology is also about the very *basis of our biology*. These are the things we take for granted and never even have to think about: our response to pain, riding a bicycle, experiencing a visual illusion or learning to speak. Psychology is also about *science* and the scientific investigation of our human nature and the social and biological contexts in which we live. But, in addition to all this – and unlike most other disciplines – psychology is about *you*. When you learn about psychology, you don't just learn about why *other* people do the things they do, you also learn about yourself – both as a social being and a biological organism – and why *you* do the things you do. It is very rarely that a student of psychology completes a course without encountering an unexpected insight into her own psychology or acquiring some knowledge that contributes to her personal growth as an individual.

That's quite a lot! But that is why psychology is one of the most popular undergraduate degrees the world over and why psychology teaching at all levels has rapidly expanded since the mid-1990s. It is difficult to conceive of any other discipline that gives the student a broader and more rounded education than psychology. The psychology graduate doesn't just learn about people's behaviour and their personality and intelligence (the kinds of knowledge you might think is useful in many areas of applied psychology, such as occupational psychology, clinical psychology, educational psychology etc.), but they will inevitably acquire knowledge of the practical skills necessary to interact with people in a variety of occupations and careers. In understanding and comparing psychological theories, they will also acquire skills of critical thinking and analysis and the need to construct and analyse psychological studies will provide them with valuable methodology and statistical skills that will be prized by many employers. Finally, psychology graduates will also take with them a knowledge of the computing and presentational skills that are now part and parcel of an undergraduate degree in the social and biological sciences.

You will encounter a lot of people unfamiliar with psychology who claim it is all common sense! It has to be said that much of it is common sense – we all have to use a bit of psychology to negotiate our lives, regardless of whether we have studied it or not. However, much of what seems like common sense in psychology is often only so with hindsight. For example, one of the simplest rules of behaviour is that if you reward someone for doing something, they are more likely to do it again (the principle of reinforcement – Chapter 8, p.106). Yet how many of us actually verbalise that rule and use it consistently? Certainly not the mother who responds to her child's tired tantrum in the street by buying him a toy or magazine or the person who showers her partner with attention and affection when he is having a jealous sulk at a party. While some psychology is common sense, much of what we learn about people when we study them closely is counterintuitive – and some of it is downright strange! Focus point 1.1 gives you the flavour of some of the unusual facts you will come across during the course of reading this book.

Potential of psychology

The largest proportion of students who apply to psychology degree programmes in the UK do so because they claim to have an interest in becoming an 'applied' psychologist. That is, they want to apply their knowledge of psychology in some way – perhaps as a clinical psychologist, an occupational psychologist or maybe as one of the increasing numbers of sports psychologists.

However, psychology is not just about generating professionals and practitioners who apply their practical skills in specific settings; it is also about personal understanding and personal growth and, to this extent, the discipline has a duty to ensure that psychological knowledge informs daily life. This means finding ways not only of helping people to understand themselves and why they do the things they do, but also of making people aware of the range of activities that psychology can be applied to – with positive effects! (For a view on how psychology is relevant to everyday life, see Davey, 2007).

FOCUS POINT 1.1

Is psychology just common sense?

- Individuals who have reported being abducted by space aliens are prone to exhibit false memory effects (i.e. in laboratory tests of memory they claim to recall and recognise items they have never seen before – Chapter 33, p.489).
- People who are shown a film of a car crash and then asked how quickly the cars were going when they 'smashed' into each other estimate the speed up to 30% more quickly than people who were asked the same question, but with the word 'hit' or 'collided used instead of 'smashed' (Chapter 14, p.197).
- Most people have an optimistic bias! If are asked to respond to this statement 'Compared with others your age, are your chances of developing cancer greater than them/same as them/less than them', most people will judge themselves as being *less* at risk than their contemporaries. This is why it is often so difficult to get people to switch from unhealthy (e.g. smoking) to healthy behaviours (e.g. exercising regularly) (Chapter 35, p.527).
- People tend to accept vague and general personality descriptions as being uniquely applicable to themselves without realising that the same description can be applied to just about anyone! If you give a group of people a personality test, but ignore their answers and give everyone the same general positive feedback, everyone believes the description is true of them! This is what makes people so gullible to the vaguely worded predictions in horoscopes (Chapter 28, p.407).
- Your spouse or partner is probably the person that you think you would find the easiest to recognise. But with the disorder *apperceptive agnosia*, the individual cannot recognise familiar objects (such as tables, chairs, book, etc.) because of a perceptual impairment. Sufferers often cannot point out a shape in a busy picture or recognise an object from an unusual angle. One sufferer couldn't recognise his wife when she was standing in front of him, but could recognise her when she moved or when she spoke! (Chapter 12, p.159).
- Would you raise the alarm if smoke suddenly started billowing into the room you were in? In one study, students attended an interview to discuss life at their university. While they were filling in a preliminary questionnaire smoke was pumped into the room. Participants were either by themselves, with two confederates who completely ignored the smoke or with two other people (non-confederates) who were strangers to them. About 75% of people who were alone reported the smoke but only about 38% of those in the other two groups did! (Chapter 24, p.356).

The psychology curriculum

This book presupposes no prior knowledge of psychology and so should be quite accessible to the interested layperson, as well as to those studying psychology at a range of different educational levels. It should also be accessible and informative for those studying disciplines related to psychology (such as medicine, nursing, speech therapy, counselling etc.).

The book's contents reflect a standard curriculum for Level 1 undergraduate students and covers eight major areas of psychology. These are:

1. conceptual and historical issues on which psychology is based
2. psychobiology
3. cognitive psychology (covering the areas of perception, attention, memory, language and thinking)
4. developmental psychology
5. social psychology
6. personality and intelligence
7. psychopathology and health psychology
8. introduction to research methods and statistics.

These contents are supported by a comprehensive chapter on study skills designed specifically for psychology undergraduates, which covers basic study principles, tips on lecture note taking, writing essays and laboratory reports and revision and exam skills. A separate chapter on careers also gives the reader the fullest insight into how psychologists are employed – illustrated with the professionals' own insights into their specialised areas of psychology.

Apart from ensuring the fullest coverage of the most recent psychology curriculum, we have presented this material in an accessible and structured way. The full colour presentation with plentiful illustrative material is designed to make the reading and learning experience as pleasant as possible. All chapters contain highlighted focus points to draw the reader's attention to interesting or important facts and concepts. Chapters contain application and research method boxes designed to provide the reader with examples of practical applications of psychological knowledge and to familiarise you with the different types of research methodology that are used across the differing areas of psychology. Finally, every chapter provides the reader with suggestions for activities that will facilitate learning and understanding and further support and information is available from the book’s website at www.completepsychology.com.

Happy reading!

Graham Davey
November 2007

Reference

Davey, G. C. L. (2007) Taking psychology to the people – and making them listen. *The Psychologist*, 20, 368–9.

sectionone

Dai Jones

Conceptual and historical issues

2 Approaches to psychology 6
3 Psychology as science 20
4 Bias in psychology 32
5 Issues and debates in psychology 43

2

Approaches to psychology

Route map of the chapter

In this chapter, we will look at the ways in which psychologists go about understanding human behaviour. We'll do this in two ways. First, we will look at where psychology came from and how it developed. This will help us to understand how our ideas of what psychology is and should be have changed. We will then look at how psychology is approached today, and see that there are six main theoretical approaches. We will cover each of these approaches individually, discuss their main assumptions and evaluate the strengths and weaknesses of each approach.

Introduction

How do psychologists go about trying to understand human behaviour? You've probably heard a range of different theories that explain human behaviour. For example, that 'it's all in the unconscious', 'it's all in the genes' or 'it's the result of learning'. Are these all part of psychology? Why are there so many different kinds of explanation? We'll answer these questions in this chapter. We'll see that there are indeed several different approaches to psychology and these give different kinds of explanations of human behaviour. The different approaches work together to give a fuller picture of behaviour than one approach alone can provide. We'll start, though, by looking at where psychology came from and how it developed. If we understand the history of psychology we should be able to get a better grasp of what psychology is like today.

A brief history of psychology

It has been said that 'psychology has a long past, but its real history is short' (Ebbinghaus, 1908: 3). The standard view of psychology's history is that it stretches back to Ancient Greek philosophers, but only became independent when Wilhelm Wundt founded a psychology laboratory at Leipzig in 1879. However, in the last 30 years, approaches to its history have changed from giving a list of events to understanding the contexts within which the discipline developed (Benjamin, 1997). We'll try to give a flavour of this approach in outlining a brief history of psychology.

Before psychology

The idea that psychology can be traced back to the Ancient Greeks comes about because of the kinds of question philosophers such as Plato and Aristotle asked. The Greeks tried to answer questions about personality types and the association between the mind and the body. Such questions are part of psychology today but, as we shall see, psychology uses rather different methods to answer these questions.

The way psychology is today has been shaped by the work of philosophers since the Greeks. The Greeks started a tradition of rational thought, trying to explain things using logical reasoning. This was developed by 17th-century philosophers such as Descartes, Locke and Hobbes. Descartes claimed there was a separation between the mechanical body, which could be investigated through science, and the spiritual soul, which was a gift of God (the principle of Cartesian dualism). Locke and Hobbes, by contrast, claimed that only matter existed, that the mind was the result of the operation of nerves and the brain and that ideas were acquired from the environment. This led to a concentration on physical explanations of phenomena and a belief that the mind is a side-effect of the material brain. This inhibited the development of a science of mind during the 17th and 18th centuries because the mind was viewed as not worth investigating (Leahey, 2001).

Philosophers were not the only ones asking questions about human nature. Theologians, doctors and teachers all tried to understand human nature. What makes people good or bad? How can we explain madness? How do children learn? Again, these are all questions that are part of psychology. Of course, philosophy, theology, medicine and education are still around today and still asking the same kinds of question. So why do we have psychology? All of these disciplines are doing what Richards (2002) calls reflexive discourse – talking about human nature. They differ in the methods they use to answer questions and the kinds of answer that are looked for (theology, for example, tries to find answers in religious doctrine). Psychology came about as a new kind of reflexive discourse because people began to want a way of using science to explain human nature.

Self-test: What is reflexive discourse? What forms of reflexive discourse can you identify?

Emergence of psychology

The usual story about the birth of psychology (as already mentioned) is that Wilhelm Wundt opened a psychology laboratory in Leipzig in 1879 and started a new discipline. However, psychology actually developed gradually over the course of the 19th century and a range of forms of psychology existed before Wundt's lab opened. The idea that Wundt was the founder of psychology is now seen as an origin myth, with Wundt being chosen because he was the first to do experiments in psychology (Jones and Elcock, 2001). Modern histories describe the emergence of psychology as a logical progression from how people were describing human nature. So, let's look at how psychology emerged.

Forerunners of psychology

The late 18th and early 19th centuries saw an increasing interest in the range of mental faculties humans possessed, in where these faculties came from and in how people differed in their capabilities. The discipline of phrenology claimed that faculties were performed by organs in the brain and tried to map the locations of these organs on phrenology busts (such as that in Photo 2.1). The discipline of faculty psychology, taught in church-based universities in the USA, tried to identify faculties that could be improved, with the appropriate moral guidance. Neither approach used scientific methods to investigate these faculties, but they had the effect of preparing people for the idea of a scientific psychology (Richards, 2002).

A more scientific approach to understanding human nature came from physiology. During the 19th century, physiologists developed better understandings of how nerves and sense organs worked and started to investigate mental processes in perception. Science was getting closer to investigating mental life, but was inhibited by the dominance of the church. Human nature was still widely seen as a gift from God and outside the scope of natural science. For a science of mind to become possible, human nature had to be made natural. This happened with the development of evolutionary thought.

The theory of evolution

Evolutionary thought suggests that species change over time. Evolutionary theories started appearing in the late 18th century, but few people were convinced. This changed with Charles Darwin's formulation of a theory of evolution by natural selection (1859/1959). This quickly became accepted and firmly located humans in the animal kingdom, opening the possibility of psychology as part of natural science.

A major advocate of the evolutionary approach was Herbert Spencer (see Photo 2.2). He developed an adaptational psychology (1855/1897) that investigated how individuals acquire and pass on psychological characteristics. The most notable example of this is Spencer's formulation of social Darwinism – the view that natural selection should be allowed to run its course in the way it affected the human species. For Spencer, individuals differed in their fitness to thrive in society and passed on their degree of fitness to their offspring. Spencer argued that governments should not intervene to help the poor and weak because this would allow them to survive in the face of evolutionary pressure, overturning the process of evolution. Instead, Spencer argued, the poor and weak should be weeded out by natural selection. This view continues to influence some attempts to explain differences between groups in society (Gould, 1997). More generally,

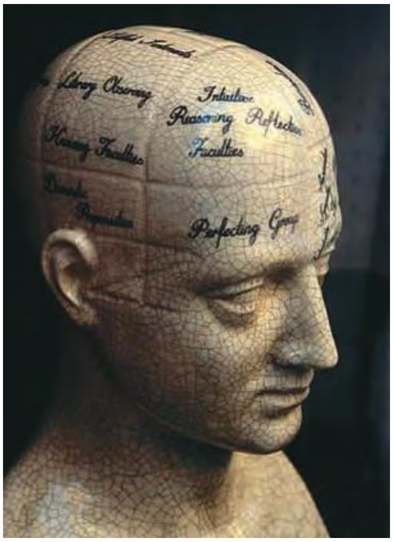

Photo 2.1 Phrenology busts are often used to represent psychology, but actually date back to before the development of the discipline.

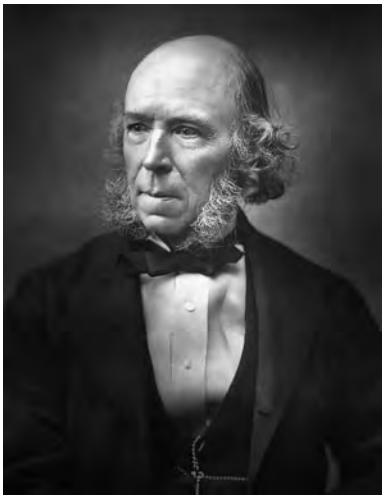

Photo 2.2 Herbert Spencer (1820–1903), the father of British adaptational psychology.

Spencer's work laid the foundations for comparative psychology, which compared human behaviours to those of other animals and for Francis Galton's work on individual differences and the inheritance of psychological traits. This approach was to have a fundamental influence on the development of psychology.

Early schools of psychology

Psychology grew quickly from the 1880s onwards, but it soon became apparent that people had different views of what psychology should be about (see Table 2.1 for a potted history of psychology). Some wanted to explain universal aspects of consciousness, some wanted to apply psychology to social problems and still others wanted to develop therapeutic techniques. These different purposes needed different kinds of theory and different methods. Soon different groups of psychologists emerged, divided in terms of their views of the appropriate subject matter and methods of psychology. These groups became known as the early 'schools of psychology' and include:

- **Structuralism** A development of Wundt's work that emphasised the search for the structure of consciousness through introspection.
- **Functionalism** Functionalism attempted to explain how mental functions enabled humans to behave in ways that were effective for survival. It introduced a focus on application, but it became necessary to focus on behaviour rather than consciousness as the subject matter of psychology.
- **Behaviourism** Behaviourism was the logical consequence of the shift to studying behaviour. It emphasised the role of the environment in guiding behaviour.
- **Gestalt** Gestalt was a German school of psychology, which rejected the reductionism of other approaches and emphasised instead holistic aspects of mental processes. Its major insights were in the areas of perception and problem solving, but it also influenced social psychology.
- **Psychoanalysis** While American psychology focused on behaviour and German psychology on consciousness, Sigmund Freud developed a psychology of the unconscious. Freud concentrated on investigating the causes of mental disorders, explaining them with a theory based on the idea of conflict in components of the unconscious.

Self-test: What were the key features of the various early schools of psychology?

TABLE 2.1	NOTABLE DATES IN THE HISTORY OF PSYCHOLOGY
1650	Rene Descartes proposes the separation of mind and body ('Cartesian dualism')
1651	Hobbes suggests mental life is composed of ideas
1690	Locke proposes that the newborn mind is a blank slate (tabula rasa)
1855	Spencer publishes *Principles of Psychology*
1859	Darwin publishes *The Origin of Species*
1860	Fechner publishes *Elements of Psychophysics*
1861	Broca identifies speech areas in the brain through autopsy
1869	Galton publishes *Hereditary Genius*
1872	Darwin publishes *The Expression of the Emotions in Man and Animals*
1873	Wundt publishes *Principles of Physiological Psychology*
1875	The Psychological Society of Great Britain formed, folding in 1879
1876	First issue of *Mind: A Quarterly Journal of Psychology and Philosophy* published
1879	Wundt opens experimental psychology laboratory at Leipzig

TABLE 2.1	NOTABLE DATES IN THE HISTORY OF PSYCHOLOGY (CONTINUED)
1880	Galton introduces use of questionnaires
1884	Hall sets up first experimental psychology laboratory in the USA
1885	Ebbinghaus publishes *Memory*
1890	James publishes *Principles of Psychology*
1892	Hall founds American Psychological Association
1898	First experimental psychology laboratories in Britain established by W. H. R. Rivers
1899	Thorndike publishes *Animal Intelligence*
1900	Freud publishes *The Interpretation of Dreams*
1901	British Psychological Society founded
1904	Spearman proposes concept of general intelligence
1905	Binet and Simon develop first intelligence tests
1906	Pavlov publishes findings on classical conditioning
1912	Wertheimer describes the *phi* phenomenon, the first account of Gestalt psychology
1913	Watson publishes ‘Psychology as the behaviourist views it’
1916	Stanford-Binet IQ test developed
1929	Boring publishes *A History of Experimental Psychology*
1932	Bartlett publishes *Remembering*
1938	Skinner publishes *The Behaviour of Organisms*
1951	Rogers publishes *Client-Centred Therapy*
1952	Translation of Piaget’s *The Origin of Intelligence in the Child* into English
1953	Skinner publishes *Science and Human Behaviour*
1956	Miller publishes work on the ‘magic number’ 7 ± 2; Bruner, Goodnow and Austin publish *A Study of Thinking;* Beginnings of cognitive psychology
1967	Neisser publishes *Cognitive Psychology*
1970	*Journal of Cross-cultural Psychology* first published
1974	American Psychological Association decides, by vote, that homosexuality is not a disorder

FOCUS POINT 2.1

Ways of explaining

Different approaches to psychology exist because a given psychological phenomenon, such as emotion, can be explained in a range of different ways. For example, emotions can be explained as a set of cognitive thought processes or as a set of physiological brain processes. The classic illustration is of explaining a handshake. A handshake can be explained from a range of different approaches:

- To the behaviourist, the handshake could be the result of previous conditioning, having been associated with some reward.
- To the psychoanalyst, the handshake could be the result of a desire for physical contact.
- To the cognitive psychologist, the handshake would be the result of purposive mental processes, for example the result of consciously deciding to show friendship.
- To the humanist, the handshake may be the result of a need for acceptance.
- To the physiologist, the handshake might be the result of particular sets of neural and muscular processes; alternatively, it might be due to a gene for sociability.
- To the social constructionist, a person might shake hands because it's been constructed within society as the right thing to do.

No one form of explanation is necessarily the right one to use, since all offer some insights into human behaviour. The approaches usually complement one another and often psychologists will consider a phenomenon from a range of approaches or work in teams with other psychologists with different perspectives.

Psychologists differ in their preferred form of explanation. They adopt a particular approach for a range of reasons, some of which we'll look at in Chapters 4 and 5. As you learn more about psychology and the approaches it uses, you'll find that you develop a preferred approach too.

Theoretical approaches to psychology

Up until the 1950s it was common to characterise psychology in terms of the different schools that psychologists adhered to. For most psychologists their favoured school was behaviourism. However, after the Second World War the discipline of psychology diversified considerably and a range of fields of study began to be identified – for example, social psychology, child development and learning theory. At the same time, psychologists started to use different ways to investigate phenomena. Two psychologists studying the same field might approach a topic using quite different approaches to investigation and to theory development and produce different kinds of explanation (see Focus point 2.1). It's now usual to characterise psychology in terms of fields of study and the theoretical approaches used in those fields. This book is organised according to the different fields of study in contemporary psychology and this section provides an overview of the different approaches that are used in the various fields.

Behaviourist

Behaviourism was the dominant school in English-speaking psychology until the end of the 1950s. It had a rigorous scientific method, promised to explain all aspects of behaviour and lent itself to application in areas as diverse as behavioural therapy and education. It is no longer dominant, but remains an important approach in some areas of psychology, particularly in the study of learning and in therapeutic applications (see Chapters 8 and 34 respectively).

Key features of behaviourism

Behaviourism is often presented as a revolution in psychology stirred up by John Watson's paper 'Psychology as the behaviourist views it' (1913). However, it is more realistic to say that behaviourism was the inevitable result of a move in American psychology from investigating mental events to investigating behaviour (Leahey, 2001). Certainly, though, Watson led the move to behaviourism and outlined the initial scope of the approach. He suggested that psychology should discard the notion of mind and other mentalistic concepts, since these could not be observed objectively. For psychology to meet the assumptions of science (see Chapter 3), Watson argued that psychologists should investigate only observable behaviour.

Behaviourism changed the subject of psychology from mind to behaviour, but also changed the terms in which psychology explained human nature. Previous approaches explained behaviour in terms of evolutionary adaptation or mental processes. In contrast, behaviourism emphasised the importance of the environment in shaping behaviour. Behaviourism explained behaviour in terms of associations made between stimuli (S) and responses (R) through interaction with the environment. For example, you might smell food (the stimulus) and feel hungry (the response).

There are two main theories of learning: classical conditioning and operant conditioning. The theory of classical conditioning is based on the work of Pavlov. Pavlov noted that dogs salivate when they see food and attempted to provoke salivation with an alternative stimulus. To achieve this, Pavlov sounded a bell whenever food was presented. Over time, the bell became a trigger for salivation, even when no food was present (see Chapter 8 for a fuller description).

The theory of operant conditioning comes from the work of B. F. Skinner. In operant conditioning, the consequences of a response affect learning. Skinner investigated this by training rats to press a lever in exchange for food and found that rewarding an action increased the likelihood of that action being performed. This is called positive reinforcement. Its opposite is negative reinforcement, whereby punishment (such as electrical shock) reduces the likelihood of an action occurring.

Evaluation of behaviourism

Behaviourism had, from its beginnings, a practical focus. A significant part of behaviourism's early appeal was that it promised to provide a means of social control. If behaviour is the result of experiential learning, then we can change behaviours by changing people's experiences. If we can change behaviours, then we can change society.

Applications of behaviourist theories are used frequently today. These include behavioural therapies such as desensitisation therapy and aversion therapy – based on the view that 'abnormal' behaviour arises through conditioning (see Chapter 34 for more on these therapies) – and teaching techniques such as programmed instruction, where tests are used to provide positive reinforcement to successful learning.

Behaviourism has had a significant effect on theory development in psychology. Current theories of learning rely on behaviourist principles, as does Bandura's (1977) social learning theory. Behaviourism's greatest effect, however, has been on methodology. Behaviourism emphasised the principles of hypothesis testing and controlled experimentation that underpin scientific methodology in psychology (see Chapter 3).

Despite the influence of the behaviourist approach, a number of criticisms have been levelled at it (Barker, 2003). It is said that it is mechanistic, in that it ignores mental processes. It is overly environmentally deterministic, in that it overlooks the importance of biological factors in behaviour. It overlooks the finding that there are biological constraints on what behaviours a species can perform (for example, you can't teach rats to fly, no matter how much learning occurs). Finally, it has problems in accounting for a range of behaviours, particularly those that are complex, like driving, and those that are spontaneous, like language.

Self-test:

- What are the key features of behaviourism?
- What was the main impact of behaviourism on contemporary psychology?

Psychodynamic

The term psychodynamic covers Freud's original theory and later theories based on Freud's work, such as those of Adler (1927), Erikson (1950) and Jung (1964). These theories argue that behaviour is shaped by the dynamic interaction of drives and forces within the individual, particularly in the unconscious mind. We'll concentrate on Freud's theory of psychoanalysis (Freud, 1949) as one example of the psychodynamic approach.

Key features of the psychodynamic approach

Freud claimed that the mind is made up of three parts: the conscious, the preconscious and the unconscious. The conscious mind contains thoughts and perceptions, but is only a small part of the total, usually described as the tip of an iceberg (see Figure 2.1). The preconscious contains material available to consciousness, including memories and stored knowledge. The unconscious is the largest part of mind and contains wishes and desires formed during early childhood, biological instincts and drives. Most of our behaviour is determined by the unconscious mind.

Personality is made up of three parts – the id, the ego and the superego. The id, located in the unconscious, contains sexual and aggressive instincts that demand instant gratification. The ego, located in the conscious and preconscious, develops in early life as a rational mechanism to decide between the id and the outside world. The superego is the conscience, which develops by the age of 5 under the influence of authority figures. The superego places constraints on behaviours and uses feelings of pride and guilt to achieve compliance.

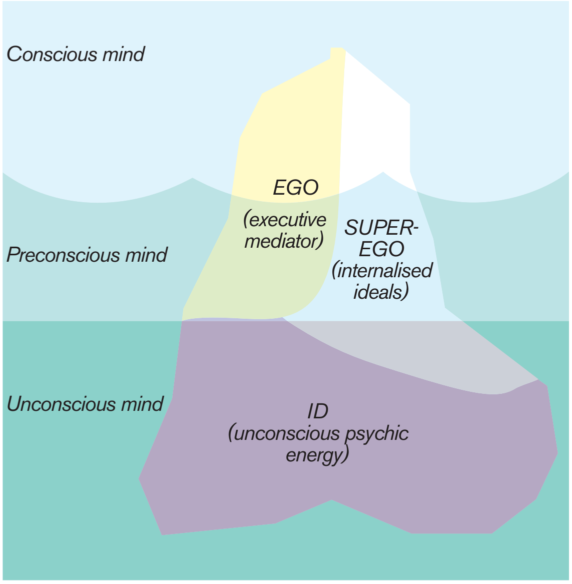

Figure 2.1 Freud's 'mental iceberg' view of the mind

Psychological development is claimed to take place in a series of fixed psychosexual stages. Each stage represents the concentration of libido (pleasure derived from organs) on a different part of the body. Fixating on (sticking at) one stage may cause neuroses in later life. The stages are:

- oral (0–18 months)
- anal (18–36 months)
- phallic (3–6 years)
- latent (6 years–puberty)
- genital (puberty onwards).

The most important of these is the phallic stage, when the child becomes aware of his or her gender. It is at this stage that the Oedipus complex occurs. This is when an unconscious rivalry develops in the child between themselves and the same-sex parent for the affection of the opposite-sex parent. Boys experience castration anxiety, resolved through identification with the father, while girls experience penis envy, which becomes sublimated into a wish to have a baby.

The id, ego and superego are in constant conflict between their competing demands. The ego resolves conflict using defence mechanisms, including:

- repression, pushing unwanted ideas into the unconscious
- displacement, diverting energy into other activities
- denial, refusing to accept the existence of a threat
- reaction formation, when someone takes an attitude opposite to their real feelings.

The most important of these is repression, which is responsible for most of the contents of the unconscious. Once in the unconscious, threatening ideas continue to exert an influence and may lead to psychological problems.

Psychoanalysis emphasises the effect of early experiences in shaping adult personality. It attempts to treat neuroses by bringing thoughts from the unconscious into the conscious. Methods include free association, when the client says whatever comes into their mind in response to a cue, and dream analysis, where the analyst identifies unconscious material that is represented in dreams (see Chapter 34).

Evaluation of the psychodynamic approach

Psychoanalytic theory has had a significant impact. Freud's original work has led to a range of psychodynamic theories and the approach has contributed to a range of topics within psychology, including those of personality, development and abnormality. The main impact of psychodynamics has been on therapeutic techniques within clinical and counselling psychology. Psychoanalysis has also had a significant cultural impact. Many people's

FOCUS POINT 2.2

Psychoanalysis and film criticism

As we learnt earlier in this chapter, psychoanalysis has proved influential in the field of film criticism. Let's look at an example. The extracts that follow are taken from a review of the 1999 film *Fight Club*, starring Brad Pitt and Ed Norton (Redd, 2000). The reviewer is clearly using psychoanalytic insights to interpret representations in the film:

> *In a twist that will catch most viewers by surprise, Tyler Durden turns out to be a fragment of Jack's personality, but this is merely a device to have this mysterious and powerful character (and manifestation of wish fulfilment) appear in Jack's life. (An analysis of Tyler Durden's name reveals that in antiquated English, 'Tyler' means gatekeeper or house builder. 'Durden' has the word root dour meaning hard (as in 'durable'). His initials, T. D., invoke Todd or death in German or perhaps D. T. (delirium tremens), since Tyler is a hallucination of Jack, the waking person. Although a second viewing shows that the first understanding of the film meshes successfully with subsequent viewings, the narrative device of the alternate personality is just that and does little to tap into what is understood about multiple personalities. One of few consistencies with psychological literature is that Jack, the waking self, is depleted and becomes less powerful as Tyler becomes more dominant.*
> *[. . .]*
>
> *The film, though violent and brutally blunt, is remarkably nonsexual. The love in the film is not love between Tyler (or Jack) and Marla, nor is it homoerotic (the idea that heterosexual men need to integrate their feminine side or embrace some of the sensitivity of gay men is completely avoided). There is not a single gay character. There only is the goal of self-love, both in the sense of a well-integrated self and in the sense of the central male character, Jack-Tyler, loving his penis.*
>
> *There are also nagging fears of castration and mutilation that pervade the film. The first support meeting that Jack attends is a testicular cancer group where the members have had their testicles removed and commiserate, saying, 'We're still men.' One of the survivors of testicular cancer, Bob (Meatloaf), has grown huge breasts because of subsequent hormone imbalances, but there is no sense of his being effeminate. His breasts are almost incidental and (consistent with the rest of the film's dismissal of women) referred to as 'bitch tits.'*

everyday understanding of psychology is shaped by psychoanalysis and psychoanalytic insights are used in analysing literature, film and art (see Focus point 2.2). Richards (2002) claims that psychoanalysis has provided meaning to people's lives in a more accessible way than other approaches to psychology. Most theoretical approaches to psychology provide complex descriptions of the causes of behaviour that are difficult to understand without a wide knowledge of psychology, and that seem divorced from our everyday experiences. Psychoanalytic explanations, contrariwise, are easier to understand for the layperson and seem more directly related to our experiences. For example, most of us can understand how the nature of our relationship with our parents might affect our personalities.

It has been suggested that psychoanalysis has had a limited impact on scientific psychology (Jones and Elcock, 2001). This is because psychoanalysis is widely seen as being unscientific and hence as having little to contribute to scientific psychology. In addition, Freud's research is seen as being methodologically poor (Eysenck, 1985), being based on a small number of individual cases; as subjective, because therapy relies on the interpretation of analysts; and biased, because Freud's subjects were largely middle-class Viennese women. Many of Freud's concepts are said to be unfalsifiable (i.e. they can't be tested). For example, the concept of reaction formation can be used to explain any unexpected results. A psychoanalyst might believe that a male client is fixated at the phallic stage and has not formed a strong identification with his father. If the client protests that he, in fact, has a very close identification with his father, the analyst can explain this in terms of reaction formation: the client believes he has a close identification with the father as a defence against the castration anxiety that he unconsciously experiences. In this way, the analyst is always right.

In response to these criticisms, supporters of Freud have argued that complex theories are often untestable (Zeldow, 1995) and that the theory consists of many parts, some of which are more easily tested than others (Kline, 1989). In addition, recent studies have provided support for some aspects of Freud's theories (see Jarvis and Russell, 2002, for a review).

Self-test:

- What are the components of the mind and the personality in psychoanalytic theory?
- How has psychoanalytic theory affected everyday conceptions of ourselves?

Humanistic

After the Second World War some psychologists became uncomfortable with the mechanistic view of human nature suggested by behaviourism. An approach known as humanism developed in response to these concerns. It is mainly applied in therapy within clinical and counselling psychology and has had a relatively limited impact on academic psychology.

Key features of humanism

The humanistic approach rejects determinism and emphasises free will, believing that people act purposely to achieve psychological growth. There is a commitment to treating individuals as fully human, as only the individual can fully explain their own behaviour and experience. While scientific psychology adopts a detached perspective, humanism investigates phenomena from the subjective perspective of the individual. Humanistic psychologists also emphasise the need to study the whole person.

The leading humanists are Carl Rogers and Abraham Maslow. Both emphasise psychological health, in contrast to psychoanalysis's concentration on psychological distress. A fundamental concept for both is that of *actualisation*. Rogers (1951) suggested that people are born with an actualising tendency, driving them to achieve psychological health. A person's sense of self is an organised whole that is constantly being re-formed, in contrast to most theories of self that see it as a fixed aspect of personality. Rogers identified two components of this self-concept: the perceived self (how we see ourselves) and the ideal self (how we would like to be). Psychological health is achieved when the two components match, while distress occurs when we feel we don't match up to the ideal.

Maslow (1954) suggested that humans are born with a hierarchy of needs (see Chapter 29), claiming that we need to satisfy lower needs before we can reach higher levels and achieve psychological growth. The goal of psychological growth is to achieve self-actualisation, where we find personal fulfilment.

Evaluation of humanism

The humanistic approach has had a considerable influence on the practice of counselling. Rogers' person-centred therapy is used extensively in clinical and counselling psychology and humanistic psychology's emphasis on the counsellor helped develop the profession of counselling. Rogers also developed a range of techniques for evaluating the effectiveness of therapy, providing a research basis for clinical practice (see Chapter 34).

As with psychoanalysis, humanistic psychology has been criticised for being unscientific, which may explain its limited impact on academic psychology. There's limited evidence for humanistic concepts – largely because these are not clearly defined. In addition, therapeutic intervention depends on the client's being committed and capable of responding and Maslow's work in particular has been criticised for having a western cultural bias (Jarvis, 2000).

Self-test:

- How do Rogers and Maslow explain the achievement of self-actualisation?

- What are the main weaknesses of humanistic approaches?

Cognitive

From the 1950s onwards it became increasingly apparent that behaviourism couldn't account for complex behaviours such as language use and that it was necessary to consider mental processes to explain some psychological phenomena. The cognitive approach developed from the mid-1950s, based on the idea that the mind is like a computer (see Photo 2.3). It has become the dominant approach to experimental psychology, replacing behaviourism.

Key features of the cognitive approach

The cognitive approach emphasises the importance of active mental processing. Behaviour is seen as being the result of information processing in the brain, just as computer outputs are the result of information processing in the machine. The task of cognitive psychologists is to develop models of mental processes, in terms of discrete processing modules with specific functions and the flow of information between these modules. The approach is commonly used to explain the cognitive processes of perception, memory and problem solving, but is also used to explain social behaviour and child development. Because of this, the approach is sometimes termed cognitivism (Jones and Elcock, 2001) to emphasise its independence of any one field of study.

Photo 2.3 In May 1997 the IBM chess computer, Deep Blue, beat the world chess champion Garry Kasparov. The ability of computers to perform apparently intelligent behaviours, like playing chess, suggested that the human mind might operate like a computer. This idea formed the basis for cognitive psychology.

The main method of investigation used by cognitive psychology is the controlled experiment, a methodology carried over from the behaviourists. Other methods include computer modelling, where psychologists write programs to attempt to make computers behave like humans (see Focus Point 2.3) and cognitive neuropsychology, where psychologists investigate patients with impairments following brain injury to learn how intact brains function.

FOCUS POINT 2.3

Eliza, the listening computer program

Since the development of the electronic computer in the 1940s, people have tried to get computers to behave intelligently (the project of artificial intelligence). Examples include chess-playing computers, seeing robots and decision-making systems. These attempts to model intelligent behaviour strongly influenced the development of cognitive psychology, the view being that if computers could behave intelligently then it must be the case that humans – who are intelligent – are like computers. Attempts to model intelligence have continued and are seen by some as a way of modelling human cognition to produce theories in cognitive psychology (Strube, 2000).

This has been particularly true in the case of language processing. Human language is seen as logical and rule based and that's how computers work, so it seems quite plausible to believe that we can make computers understand language. As it turns out, it's proved rather more difficult to understand language than expected and we're still some way from the situation portrayed in *Star Trek* of talking naturally to computers and being understood. However, there are some interesting examples of computer models of language. In this focus point we'll look at an early, very simple, model of language understanding called Eliza (Weizenbaum, 1966).

Eliza emulates a Rogerian psychotherapist. Users type messages into the computer using the keyboard and Eliza responds similarly to a therapist. Over time, a form of conversation develops. Eliza can be quite convincing and people have been known to become quite attached to the program. However, the Eliza software is actually rather stupid, relying on a small number of devices to give the appearance of understanding. These include substituting strings of words, using stock phrases and turning around what you type in. Eliza has no real understanding of what you are typing and no knowledge of the world. This stupidity is a major reason why the software emulates a Rogerian psychotherapist. The Rogerian technique includes acting as an empty well, listening to what people say but not contributing knowledge to the

FOCUS POINT 2.3 CONTINUED

conversation. This technique is designed to guide the client towards their own understandings of their situation.

As stated earlier, the Eliza software can be quite convincing. Let's look at some examples of conversations with Eliza:

> Hello, I am Eliza.
** Hello, Eliza.*
> How are you today? What would you like to discuss?
** I'm unhappy.*
> Did you come to me because you are unhappy?

So far, so good. There's some variation in the responses Eliza gives to keep up the illusion:

> Hello, I am Eliza.
** Hello, Eliza.*
> How are you today? What would you like to discuss?
** I'm unhappy.*
> Do you believe it is normal to be unhappy?

The conversation continues in quite a convincing way, drawing information out of you:

> Do you believe it is normal to be unhappy?
** No, I don't.*
> Does that trouble you?
** Yes, it does.*
> I understand.

However, Eliza isn't actually that helpful.

** Can you help me?*
> You want me to be able to help you?
** Yes, very much*
> I see.
** Will you help me?*
> We were discussing you, not me.
** I want help.*
> Why do you want help?

She also has a limited repertoire and often uses the same stock phrases:

> We were discussing you, not me.
** I want help.*
> Why do you want help?
** Because I'm unhappy.*
> Do you believe it is normal to be unhappy?

Which brings us back to where we started! It turns out that even in this limited domain, the system isn't very good at understanding language. As we heard earlier, however, Eliza was an early attempt and is widely recognised to be stupid. Systems have got better since, but they are still a long way away from real understanding. Perhaps the most important lesson of such models for psychology is that language understanding is more difficult than we first thought. In particular, it has become clear that language understanding relies on extensive background information and can't always be characterised in terms of rules.

If you'd like to try Eliza for yourself, an online version can be found at http://www.manifestation.com/neurotoys/eliza.php3

Evaluation of the cognitive approach

The cognitive approach has had a significant impact in the field of cognitive psychology, but also in the fields of social psychology and developmental psychology. The approach has led to theories of social cognition and of cognitive development in children. It has also led to applications, particularly in cognitive therapy, that involve the replacement of faulty thought patterns with more effective ones (see Chapter 34).

One particular strength of the cognitive approach is that it uses a range of rigorous research methods (Eysenck and Keane, 2000). This means that if findings from different methods give the same results we can have more faith in their validity.

Despite the success of the cognitive approach it has still attracted a number of criticisms (Jones and Elcock, 2001). Cognitive research takes place in artificial settings and may not reflect our cognition in the 'real world'. There's no integrating theoretical framework for cognitive psychology. Instead, there are several separate cognitive theories that don't relate well to each other. There is also some dispute as to whether the brain is best seen as being like a computer. Computers, after all, have no emotions, morals or unconscious, all of which might be expected to influence human behaviour.

Self-test:

- How does the metaphor of the mind as a computer affect theories in cognitive psychology?
- What are the main strengths of the cognitive approach?

Physiological

The physiological approach studies psychological functioning by examining biological processes – for example, brain structure and the operation of genetics.

Key features of the physiological approach

There are three main areas of work within the physiological approach: brain function, biochemistry and heredity. These share the assumptions that biological factors underlie behaviour and that behaviour is best explained in biological terms. The physiological approach is reductionist, in that psychological functions are explained in more basic biological terms. It is also deterministic, behaviour being seen as directly determined by biological factors.

Psychologists study brain function using techniques such as fMRI scanning (Carlson, 2004) in order to identify the brain areas involved in particular tasks (see Chapter 6). They also identify patterns of impaired and spared functioning in brain-damaged patients (Parkin, 1999).

Psychologists also study biochemistry in order to understand how brain chemistry affects behaviour (Carlson, 2004). The brain uses chemicals, called *neurotransmitters*, to communicate between cells, but imbalances in the levels of these chemicals cause problems. For example, the neurotransmitter serotonin is involved in regulating mood. Sufferers of depression have low levels of serotonin. Drugs such as Prozac are effective because they increase the effectiveness of serotonin in the brain.

The study of heredity involves attempting to find a basis in our genetic inheritance for psychological phenomena. Psychologists study heredity because they believe that genes influence behaviour and determine differences and similarities between people (Plomin et al., 1997). Behavioural geneticists attempt to identify genes that may underpin psychological phenomena such as personality and intelligence (see Chapters 29 and 30).

Evaluation of the physiological approach

The physiological approach has provided explanations of behaviour across a wide range of areas of psychology and has led to treatments for disorders such as depression and schizophrenia. It has also captured the popular imagination, with genetic explanations in particular providing a framework for understanding the behaviour of others and ourselves.

The main criticism of the physiological approach is that it is overly reductionist. It is suggested (Rose, 1998) that psychological phenomena should be explained in psychological rather than physiological terms. In addition, a range of criticisms has been levelled at evolutionary explanations. These include the view that evolutionary explanations ignore the influence of the environment and that there is limited evidence for some evolutionary claims (Jarvis, 2000). A further concern is that evolutionary explanations may make antisocial behaviours, such as male aggression, seem natural and hence unavoidable and may be used to excuse injustice (Byrne, 1994; see also Chapter 4).

Self-test:

- What different areas of work are conducted in the physiological approach?
- What problems might be identified with evolutionary explanations?

Social constructionist

The social constructionist approach developed from the 1970s as a challenge to 'mainstream' psychology (Fox and Prilleltensky, 1997). This challenge came in response to concerns about gender and sexuality bias in psychology leading to the misrepresentation of women, gays and lesbians (see Chapter 4) (Photo 2.4 shows a leading British feminist psychologist).

Key features of social constructionism

Social constructionism is a diverse approach. However, social constructionists share a number of assumptions (Burr, 1995). The first is that our perceptions of the world don't necessarily correspond with natural categories. The second is that knowledge is culturally specific, so how we understand the world depends on a particular culture at a particular time. The third is that we construct our perception of the world through social interaction, particularly through language. The final assumption is that our constructions are associated with possible actions. So, for example, our construction of what it is to be female will affect our view of how women should behave.

Social constructionism rejects the positivist view of scientific psychology, that individuals can be studied objectively in isolation. Instead, social constructionists try to identify how knowledge is constructed through interactions. Social constructionists analyse people's language use through the techniques of conversation analysis and discourse analysis, to identify the ways in which people construct the world (see Research methods 2.1).

Evaluation of social constructionism

Social constructionism provides detailed analyses of particular phenomena and draws on links with other disciplines, particularly sociology. It has been used to challenge sources of bias within psychology (see Chapter 4).

Photo 2.4 Sue Wilkinson, a leading British feminist psychologist.

In addition, in challenging mainstream research methods (see Chapter 3) it has encouraged scientific psychologists to reflect on the methods they use.

A fundamental criticism of social constructionism is that it is antiscientific and that its findings are overly subjective (Stainton Rogers, 2003). This goes against mainstream views of what psychology should be. The problem in social constructionism is that the theories produced may be more a reflection of the views of the psychologist than of the phenomena being investigated. In addition, most psychologists believe that there is a real social world external to individuals and reject the social constructionist view that the world is constructed by people through interaction. The social constructionist view involves a radical reconception of what the subject matter of psychology is and hence is incommensurable with mainstream approaches (Stainton Rogers, 2003). This difference is illustrated in Table 2.2 (derived from Stainton Rogers, 2003) (see Activity boxes 2.1 and 2.2).

RESEARCH METHODS BOX 2.1

Discourse analysis

Social constructionists use a range of techniques to investigate the ways in which people construct their social world. The most common technique is discourse analysis, which involves analysing transcripts of spoken interaction to identify what people are doing and seeking to achieve in communicating (Stainton Rogers, 2003). The focus is on identifying the kind of *discursive practices* that people use. For example, people may focus on the worst case scenario when describing a situation – the practice of *extreme case formulation* ('they're all the same . . .'). Alternatively, people may use the practice of *disclaiming*, when they pre-emptively deny holding a particular view before expressing that view ('I'm not a racist but . . .').

As an example of discourse analysis in practice, consider the interview transcript that follows. This is taken from an interview conducted by a researcher (Adair and Elcock, 1995) with four police officers, one a superintendent (labelled **D**), one a sergeant (labelled **B**) and two constables (labelled **T** and **J**). One of the constables (**T**) has been working undercover at illegal raves and the interview is about the police officers' views of rave culture. The interview went on for some time and only a brief section is given here. However, we shall see that we can learn important things from even a brief section of text:

D And I think you're talking about a different culture really, the afro-Caribbean as opposed to the white person and I know you get, you know, a lot of white people down there but the sort of blues parties are all about relaxed atmospheres it's not the heavy beat sort of music. I think it, it's a place to go and okay maybe have a drink but relax and enjoy it cause that's the way of life that the afro-Caribbean is. Totally different to what the white person is. The white person seems to, you know, has got this tremendous energy and as you say the, the tremendous aggression. I don't think the afro-Caribbean culture is like that. Course I'm not.

T No, they're definitely more mellow than us they don't . . .

B How, I mean what was the proportion then down at the, the rave at [name of illegal rave that T attended]. I perceive raves . . .

T Ninety five percent white . . .

B Yeah . . .

D Mmm . . .

B I mean every rave I've been to . . .

T In fact, the only afro-Caribbean's I saw there were selling drugs. [B and D laugh, T continues.] To be quite honest . . .

D If you had a better start there'd be a prime minister, wouldn't there [laughs].

B They were (xxxx 'em) [starts laughing more heartily again].

T If, no, but this is at that rave in [name]. [D starts laughing, then both B and D stop.]

T That was the only afro-Caribbeans I saw there, there was three and they were all about twenty five and were all selling.

There's a lot going on in this section of interview. For example, careful analysis shows that power relationships between the officers of different rank are maintained through language, with the superintendent dominating the conversation. The researchers though focus on evidence of racism in the language and discursive practices used by the officers. First, the researcher notes how **D** draws a distinction between what he calls different cultures, between what are in **D**'s words 'the afro-Caribbeans' and 'the white person'. At the end of **D**'s passage it would appear that he is just about to disclaim racism, but **T** interrupts him, possibly in her eagerness to agree. The particular racist representation deployed by **D**, lack of energy, serves the pragmatic purposes of this interaction, explaining why black people don't rave. Second, the researcher notes the way in which **D** refers to white people, while in his references to 'the afro-Caribbeans' there is no personhood granted. The third piece of evidence is the way that **D** generalises from a particular instance (the blues party) to a group of people.

Self-test:

- What are the shared assumptions underlying the social constructionist approach?
- In what ways does social constructionism challenge 'mainstream' psychology?
- How might mainstream and social constructionist approaches explain attitudes?
- How does modern psychology relate to previous philosophy?
- Why do psychologists adopt differing approaches to investigating psychological phenomena?

TABLE 2.2 MAINSTREAM AND SOCIAL CONSTRUCTIONIST VIEWS OF ATTITUDES

Mainstream	Social constructionist
Attitudes are evaluations of objects operating at personal, interpersonal and intergroup levels. They are believed to be discrete from other attitudes and isolated from other factors such as social norms and value judgements	Attitudes are interconnected and related to other evaluations such as values
Attitudes have cognitive, emotional and behavioural components and are developed by individuals through experience and external sources of information	Attitudes are intersubjective, i.e. they are based on shared understandings rather than being the products of individual minds
Attitudes are relatively fixed and can be measured using attitude scales such as the Likert scale	Attitudes are variable with context and can change over time and in different situations; individuals may hold contradictory views of the same object
Attitudes have four main functions – categorising knowledge, guiding behaviour, communicating with others and building self-esteem	Attitudes serve particular functions and need to be investigated in terms of what attitudes are meant to achieve. For example, attitudes may be used to justify certain behaviours

ACTIVITY BOX 2.1

Analysing approaches to phenomena

We have seen in this chapter that psychologists might adopt a range of different theoretical approaches and different psychologists might adopt different approaches to investigate the same phenomena. Using different approaches produces different kinds of explanation of these phenomena. To highlight this, think about what kinds of approach might be used to investigate the following phenomena and what kinds of explanations we might expect. The table has one example partially filled in, but you can give fuller explanations and consider that phenomenon with other approaches. All the phenomena listed are discussed elsewhere in the text.

Phenomenon	Approach	Explanation
Schizophrenia	Physiological Cognitive	Effects of levels of dopamine in the brain Disordered thought processes following normal learning processes
Intelligence		
Attitudes		
Gender differences		
Aggression		
Anxiety and phobia		
Memory		

ACTIVITY BOX 2.2

Evaluating approaches

The range of theoretical approaches in psychology can be quite dizzying. One helpful way of understanding the range of approaches is to summarise the main features of each approach in a table. Draw up a table like the one that follows, leaving a column for each approach. Each row of the table corresponds to a particular aspect of the approach. Use the aspects given here, but feel free to add your own.

On the basis of your reading in this chapter and the rest of the book, fill in the table. It will be helpful to keep a copy of the table and to add to it as you learn more about each approach.

Don't worry too much if you can't fill in everything straightaway. It will come to you as you learn more about psychology. Similar tables are included in Barker (2003) and Malim and Birch (1998).

In Chapter 5, we look at a number of debates in psychology. After reading that chapter, add a row saying where each approach stands on those debates.

Approach	**Behaviourist**	**Psycho-dynamic**	**Humanist**	**Cognitivist**	**Physio-logical**	**Social constructionist**
Basic assumptions about human nature						
Methods of study						
Applications						
Main contributions						
Main criticisms						

Learning outcomes

When you have completed this chapter, you should be able to:

1. Explain how and why psychology emerged as an independent discipline.
2. Describe the early schools of psychology.
3. Outline the key features of a range of theoretical approaches to psychology.
4. Evaluate theoretical approaches to psychology.
5. Explain how different approaches provide different kinds of explanation of psychological phenomena.

Further reading

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Jones, D. and Elcock, J. (2001) *History and Theories of Psychology: A Critical Perspective*. London: Arnold.
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Richards, G. (2002) *Putting Psychology in its Place*. Hove: Psychology Press.

Essay titles and references

1 Why is it important to study the history of psychology? Critically discuss, considering how different ways of studying the history of psychology tell us different things about the discipline. Use examples of how studying historical developments has revealed things about psychology.

Benjamin, L. (1997) *A History of Psychology: Original Sources and Contemporary Research*, 2nd edn. New York: McGraw-Hill.

Danziger, K. (1994) Does the history of psychology have a future?, *Theory & Psychology*, 4(40), 467–84.

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Mills, J. (2000) Hard-nosed psychologists: Some reflections on writing psychology's history, *Theory & Psychology*, 10(3), 399–412.

Pickren, W. and Dewsbury, D. (eds) (2002) *Evolving Perspectives on the History of Psychology*. Washington, DC: APA.

Richards, G. (2002) *Putting Psychology in its Place*, 2nd edn. London: Routledge.

2 Critically evaluate the cognitive approach to psychology. What are its strengths and weaknesses? Is the approach useful and productive?

Bechtel, W. and Abrahamson, A. (2001) *Connectionism and the Mind: Parallel Processing, Dynamics and Evolution in Networks*, 2nd edn. Oxford: Blackwell.

Braisby, N. and Gellatly, A. (eds) (2004) *Cognitive Psychology*. Oxford: Oxford University Press.

Harré, R. (2002) *Cognitive Science: A Philosophical Introduction*. London: Sage.

Jarvis, M. (2000) *Theoretical Approaches in Psychology*. London: Routledge.

Jones, D. and Elcock, J. (2001) *History and Theories of Psychology: A Critical Perspective*. London: Arnold.

Osbeck, L., Malone, K. and Nersessian, N. (2007) Dissenters in the sanctuary: Evolving frameworks in 'mainstream' cognitive science, *Theory & Psychology*, 17(2), 243–64.

Potter, J. (2000) Post-cognitive psychology, *Theory & Psychology*, 10(1), 31–8.

Potter, J. (2005) Making psychology relevant, *Discourse and Society*, 16(5), 739-7.

Smith, E. and Kosslyn, S. (2006) *Cognitive Psychology: Mind and Brain*. Upper Saddle River, NJ: Prentice-Hall.

3 Critically evaluate the challenge social constructionism poses to 'mainstream' psychology. Is the approach successful in suggesting an alternative to scientific psychology? Is this alternative approach a valuable one for psychology to adopt?

Augoustinos, M., Walker, I. and Donaghue, N. (2006) *Social Cognition: An Integrated Introduction*, 2nd edn. London: Sage.

Burr, V. (2003) *Social Constructionism*, 2nd edn. London: Routledge.

Dickins, T. (2004) Social constructionism as cognitive science, *Journal for the Theory of Social Behaviour*, 34(4), 333–52.

Gross, R. (2003) *Themes, Issues and Debates in Psychology*, 2nd edn. London: Hodder & Stoughton.

Hepburn, A. (2003) *An Introduction to Critical Social Psychology*. London: Sage.

Hosking, D.-M. and Morley, I. (2004) Social constructionism in community and applied social psychology, *Journal of Community & Applied Social Psychology*, 14(5), 318–31.

Jarvis, M. (2000) *Theoretical Approaches in Psychology*. London: Routledge.

Jost, J. and Kruglanski, A. (2002) The estrangement of social constructionism and experimental social psychology: History of the rift and prospects for reconciliation, *Personality and Social Psychology Review*, 6(3), 168–87.

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Conceptual and historical issues

3

Psychology as science

Route map

In this chapter, we look at scientific psychology. We start by thinking about the ways in which we come to know things and consider science to be a 'way of knowing' with particular strengths. We look at how views of science developed over time and what the principles and assumptions underlying scientific psychology are. We then look at how psychology can be carried out scientifically and evaluate whether it can be seen as a science. Following this, we consider a range of issues in scientific psychology, including threats to the validity of psychology research and ethical issues. We conclude by thinking about some alternatives to scientific psychology.

Introduction

'Is psychology a science?' This is probably the most common assessment question facing the new student of psychology. It might seem a strange question to ask, given that psychology is usually described as the science of mind and behaviour. The fact the question is asked at all might suggest that some psychologists have concerns about the status of scientific psychology.

It's not giving too much away to say that a short answer to the question is 'Yes, but . . .'. In this chapter, we examine the reasons for the 'yes' answer, by looking at the features of science and how psychology corresponds to these. We also look at reasons for the 'but . . .', by considering some issues to be borne in mind when doing scientific psychology. We conclude by looking at some alternatives to scientific psychology.

Science as a way of knowing

We saw in Chapter 2 that psychology developed as an attempt to be scientific in answering questions about mind and behaviour. Here we look at why its early pioneers wanted to adopt a scientific approach, and at how the scientific approach developed.

Ways of knowing

People have used a range of different approaches to investigate human nature. Any approach, such as philosophy, has a common way of finding things out. In the case of philosophy, people try to understand human nature through logical reasoning. Any way of knowing is based on beliefs about what kinds of things exist (ontology), what we can know about these things (epistemology) and how we can find out about these things (methodology). These three areas are linked. Deciding what we think exists will affect what we think we can find out. For example, if we think the mind is linked to the brain (ontology), then we'll believe we can find the link (epistemology). We might further believe that we can find the link by using brain scans (methodology), but not by using questionnaires.

Most psychologists favour the scientific method to answer questions about mind and behaviour. What this means is that most psychologists adopt a certain view of the world, which says that psychological phenomena are real and that these real phenomena can be investigated through science.

Self-test: What do the terms 'ontology', 'epistemology' and 'methodology' refer to?

Appeal of science

Science involves observing how things are, making informed predictions about the effects of different actions and testing these predictions with evidence. For example, we may observe that short words are easier to remember than long ones and thus predict that if we give people lists of long and short words to remember, they'll remember more short words. We test this by getting people to remember words to see if we are right. Of course, anyone could test our idea in this way, meaning that others can independently verify our prediction. One major appeal of science is that findings can be tested, allowing us to be confident that what we know is actually true.

Another appeal of science is that it seems to have improved people's lives. It was science that led to the development of technologies such as electric lighting and the telegraph. With the development of scientific psychology, there was a promise of explanations of mind and behaviour that could lead to practical interventions to help people (Jones and Elcock, 2001).

Self-test: What factors make science an appealing way of knowing for psychology?

Development of science

Science developed over several hundred years, driven by the work of philosophers of science. In the early 19th century, Comte said science should concentrate on observed facts, so that we could find positive, rather than theological or philosophical, truths. This philosophy – known as *positivism* – emphasised the use of induction. Induction is the process of deriving general truths from observed facts, so if we observe that a number of people remember more short words than long words, we might derive the general truth that short words are easier to remember than long words. Wundt's first scientific psychology was positivist.

The 'Viennese Circle' of philosophers extended positivism in the 1920s to emphasise the development of logical theories (logical positivism). Logical positivism says that scientists should use deduction to make specific predictions on the basis of general principles. First, we develop theories to explain observations. We might theorise that we can remember words for a fixed period of time, say 2 seconds, and that we can fit more short words than long words into the 2 seconds. We then use this theory to make specific claims that we can test, so we might make the specific claim that if we give people long and short words to remember, they'll remember more short words. If the prediction comes true, our theory has been verified, so if people do indeed remember more short words, we'll assume our theory was correct. If the prediction doesn't come true, i.e. people remember more long words, our theory is wrong. This approach was adopted by behaviourism and came to dominate experimental psychology. It has become the standard scientific methodology in psychology (McGhee, 2001).

Self-test:
- What does the philosophy of positivism emphasise?
- How did the Viennese Circle philosophers extend positivism?

Logical positivism has attracted some criticism. A major source of this was Popper. He argued that we should test theories, rather than try to verify them. This is because the same results can verify more than one theory, but only one theory can be true. Popper suggested that scientists should try to *disprove* their theories. For Popper, the mark of a good scientific theory is falsifiability (i.e. the theory can be found to be false). This idea has been adopted in psychology and is used to evaluate whether or not theories are scientific. For example, psychoanalysis is often criticised for being unscientific because many of its theories can't be disproved.

The logical positivists and Popper described how science *should* be done. However, Kuhn showed that science is *actually* done somewhat differently. He observed that scientists tend to stick to their theories even when they're not supported. Instead of modifying theories, scientists tend to dismiss contradictory results as false. Kuhn said there are periods of 'normal science', when scientists share a particular approach (a *paradigm*). Then, over time, more and more contradictory results are found and it becomes increasingly hard to dismiss them as false. Eventually, some scientists suggest a radically different approach that explains the results better than the standard paradigm. The new paradigm gradually becomes accepted and eventually replaces the previous paradigm in a 'scientific revolution'. The change from behaviourism to cognitive psychology is often described as a revolution in this sense.

Self-test:
- What characteristic did Popper claim as the mark of a good scientific theory?
- How did Kuhn claim scientific revolutions operate?

Psychology as science

Nature of science

Science has certain assumptions, aims and methods. If psychology is a science, then we'd expect it to share these. In this section, we'll outline the nature of science. We'll then consider the extent to which psychology can be considered a science.

Assumptions of science

Science makes certain assumptions about how the world works. These include the following:

1. Determinism If the world has order, then events have identifiable causes. Scientific psychology tries to find the causes of human behaviour.
2. Empiricism Theories must be based on publicly available evidence, gathered through observation.
3. Order The world has order, meaning that events don't happen haphazardly. We should be able to identify regular patterns in events.
4. Parsimony Explanations of events should not go beyond the available evidence and should explain as much of an event as possible in the simplest way possible.

Aims of science

Science has aims of description, prediction, understanding and control, as follows:

1. Description Science provides objective descriptions of phenomena, which are free from personal bias.
2. Prediction Descriptions allow scientists to identify

regular patterns in phenomena. This allows scientists to make testable predictions about how things are.

3 Understanding Finding regular patterns and testing predictions allows scientists to identify causes and effects. This gives us a better understanding of the nature of events.

4 Control If we have an accurate understanding of the causes of events, then we can control those events.

Self-test:

- What assumptions does science make about how the world works?
- What are the aims of science?

The scientific method

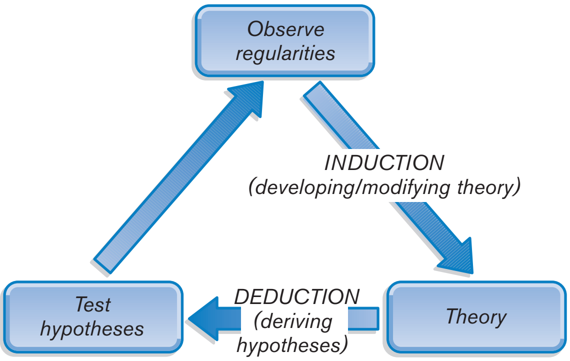
The scientific method is an approach to gathering data and developing theories. Data are collected objectively, in a way that is controlled, precisely defined and in a way that can be replicated by others. Theories are developed on the basis of evidence, using a combination of induction and deduction. There are a number of stages in the scientific method, as follows:

1 Observe regularities For example, television is getting more violent and there's more violence in society (see Activity box 3.1).

2 Develop a theory People imitate what they see on television, so watching violent programmes increases aggression.

3 Develop a prediction Participants shown violent TV programmes will exhibit more aggression than those shown non-violent TV programmes.

4 Test the prediction Run an experiment that shows one group of participants violent TV programmes and another non-violent ones. Measure their aggression afterwards and see if there's a difference.



Observe regularities
INDUCTION (developing/modifying theory)
Test hypotheses
DEDUCTION (deriving hypotheses)
Theory

Figure 3.1 The hypothetico-deductive method (Source: adapted from Barker, 2003)

5 Evaluate the theory If the prediction is supported, then assume that the theory is correct. If the prediction isn't supported, then change the theory. ■

This process is also known as the hypothetico-deductive method (see Figure 3.1).

Self-test: What are the five stages of the scientific method?

Doing psychology scientifically

Psychology uses the hypothetico-deductive method to generate and test predictions and to develop theories. The standard approach to testing predictions is to conduct experiments. The logic of an experiment is that, all other things being equal, if we make a change in a situation and then observe an effect on some measurement, we can assume that the change caused the effect. In investigating whether watching violent television leads to an increase in aggression, then, we change the situation by varying the type of television programme (the *independent variable*). We gauge the effect of the type of programme by measuring

ACTIVITY BOX 3.1

Thinking about experiments

We've used the example of an experiment studying the effect of watching violent television programmes on levels of aggression. The study involved:

- Forming two groups of people.
- Showing one group of people violent television programmes and the other group of people non-violent television programmes.
- Measuring levels of aggression in our two groups of people and looking to see if there is a difference between the two groups.

We believe that if we find that levels of aggression differ between the two groups, this is caused by showing the groups different television programmes. That is, violent television caused an increase in levels of aggression.

Think about the following questions:

1. If we find a difference between the groups, what other reasons might there be for the difference, apart from the kind of television programme watched?
2. How might we measure aggression in this study?
3. What does this study teach us about the causes of aggression in real life?

You might find these questions a bit strange at first. Read through the section on the scientific method again (pp. 22–3) and then try answering the questions.

aggression (the *dependent variable*). There are two main considerations in doing psychology experiments: the need for control and the need to define measurements. We will look at these now.

Self-test: What is the logic that underpins the use of experiments?

Need for control

If we find that those watching violent television show more aggression than those watching non-violent television, then we assume that the type of television watched affects the level of aggression shown. In other words, we ascribe a cause and effect relationship. However, this conclusion is only valid if nothing else differs in the experiment. Alternatively, the people to whom we show violent programmes may already be more aggressive than those shown non-violent programmes, so when we measure aggression later we are just finding a difference that already existed. Similarly, the violent programme and the non-violent programme might differ in other ways. One might be more emotional than the other and it is that (rather than the violence) that may have had an effect on aggression.

When we do experiments in psychology, it's important to use experimental control to ensure that the only things that differ in the experiment are those we want to differ. It can be difficult to control all the different things that affect human behaviour. When we do control everything possible, we may find that the study loses validity, because we end up with an artificial situation.

When we, as experimenters, are responsible for changing the situation (for example, the type of programme) then we have a pure experiment. If we have adequate control, we can be confident that any effect we find was caused by the change we made. However, it's not always possible for us to change the situation. For example, if we're interested in gender differences in intelligence, we can't change the gender of our participants. In this case, we're looking for differences between groups that already exist. This kind of experiment is called a *quasi-experiment*. It has the same form as a pure experiment but we're not responsible for the differences. In this case, we can't ascribe cause and effect because there may be other causes of any differences we find. For example, we may find that girls score higher on intelligence than boys, but we can't guarantee that there are biological reasons for this. It may be that girls receive a better education than boys or are socialised to try harder. (A fuller account of the use of the experimental method in psychology can be found in Chapter 37.)

Self-test:

- Why do we need to use experimental control in experiments?
- What can't we do on the basis of results from quasi-experiments?

Defining measurements

The things that natural sciences investigate tend to be tangible, so people can agree what they are and how they should be measured. A physicist might investigate whether objects stretch when moving quickly by measuring them at rest and again when they are moving. The findings from such a study would be uncontroversial. However, the things psychology investigates are often unobservable, which positivist science can't discuss (Jones and Elcock, 2001). For example, we can't measure extroversion with a tape measure. Instead, psychologists have to develop indirect measures of concepts using operationism. Operationism says that unobservable factors produce observable consequences. So, we can investigate them if we define the factors in terms of measures of their consequences. Extroversion leads people to behave in certain ways, so we can investigate extroversion by defining it in terms of these behaviours.

Operationism involves identifying an unobservable hypothetical construct. This is something that is claimed to exist, but that cannot be directly measured, such as extroversion. We can give a *theoretical* definition of extroversion, as an outward-directed personality trait. This tells us what it is, but not how it can be measured, so we can't investigate extroversion scientifically. For that, we develop an operational definition that specifies how the construct is measured – for example, as a score on a questionnaire. Using this definition we can investigate extroversion scientifically (see Focus point 3.1).

Self-test: What does operationism involve?

FOCUS POINT 3.1

Operationism and the measurement of extroversion

As an illustration of operationism in action, let's focus on the measurement of extroversion. We start with a hypothetical construct. We might say that extroversion is a fixed personality characteristic that contributes, together with other traits such as neuroticism and psychoticism, to the totality of an individual's personality.

We need to specify what we think extroversion is, so we give a theoretical definition: an outward directed and sociable personality trait that leads people to be impulsive and risk taking. The theoretical definition is a

FOCUS POINT 3.1 CONTINUED

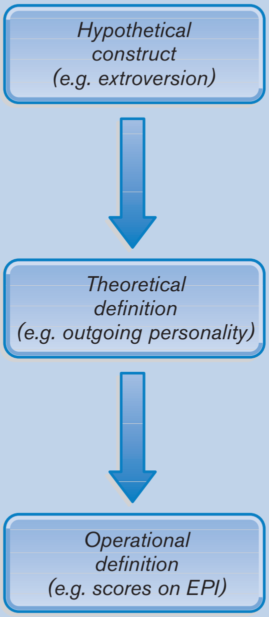

Hypothetical construct (e.g. extroversion)
Theoretical definition (e.g. outgoing personality)
Operational definition (e.g. scores on EPI)

Figure 3.2 Operationism

part of the hypothetical construct – we can't say extroversion exists without saying what we think it is.

Having developed a theoretical definition of the construct, we can then start to think about how we might measure it. We can't observe extroversion directly, so instead we need to use an operational definition of the construct to say, on the basis of the theoretical definition, how we can measure extroversion. Given that we've defined extroversion in terms of being sociable, risk taking and impulsive, we might measure extroversion by counting how many of these behaviours people engage in: this can be done by observation, but this may not be convenient. It's easier to ask people about their behaviour, so we can give an operational definition of extroversion in terms of people's reports of how often they engage in behaviours that we think are extroverted.

One good example is the Eysenck Personality Inventory (EPI) (Eysenck and Eysenck, 1964). This consists of a set of statements asking people about their behaviour, including behaviour that is extroverted or introverted. Respondents are asked to indicate whether or not the statement applies to them. Some sample statements related to extroversion include 'Generally, do you prefer reading to meeting people?' and 'Are you fairly talkative when with a group of people?' A respondent's score for extroversion is based on how many extrovert behaviours they routinely engage in.

The process of operationism is illustrated in Figure 3.2.

Evaluating scientific psychology

We've seen that science relies on the assumptions of order, determinism and empiricism. As you read through this book, you'll see that most theories in psychology reflect these assumptions. Psychologists use empirical data to develop ordered theories of how behaviour is caused. We saw that science has the aims of description, prediction, understanding and control (see Activity box 3.2). We'll see many examples of psychology's success in meeting these aims. Being a science also involves using the scientific method to investigate human behaviour. We've seen how psychology uses measurement, experimental control and the hypothetico-deductive method. It's clear that psychology can, indeed, be done scientifically.

ACTIVITY BOX 3.2

Evaluating scientific methods in psychology

Which of the scientific methods has had the most impact on psychology? Discuss.

This chapter has talked about psychology as science and has introduced the hypothetico-deductive method as 'the scientific method' in psychology. In fact, there is a range of research methods psychology uses that are considered scientific, although the laboratory experiment is usually seen as the 'gold standard'. This range is discussed more fully in Section 8, but also in the Research methods boxes throughout the text. In the current discussion, you are asked to consider the range of methods and to think about the impact these methods have had on psychology as a discipline.

Particular issues you might want to think about in discussing the question include:

- What is science? You should discuss the principles and aims of science that we might use to judge whether or not a particular method can be classed as scientific.
- What research methods are used in psychology? For each of these, you should think about the extent to which they can be judged to be scientific.
- Which of the research methods discussed has had the biggest impact? This might be in terms of the

amount of research conducted and the number of theories produced using the method, but also in terms of psychology's effort to be a science and psychology's popular perception.
- What has the effect of this impact been? You should think about whether the method been productive and whether its use has led to the benefits psychologists expected. In addition, however, you should think about the disadvantages of using the method. Have there been things psychology has not been able to investigate?

At the start of the chapter we said the short answer to the question 'Is psychology a science?' was 'Yes, but . . .'. We've already seen the reasons for the 'yes'. There are two reasons for the 'but . . .'. First, there is a range of issues we need to consider to ensure that psychology is a good science. We will look at these in the next section. Second, there is an ongoing argument about whether psychology should be done scientifically, even though it can be. We consider this argument in a following section, entitled 'Alternatives to scientific psychology'.

Issues in scientific psychology

Psychology differs from other sciences because its subject matter is often intangible and also because people *react* to being studied. In addition, the things psychology investigates may change over time. If you watch a film or television programme from the 1950s you'll see that people seem to be very reserved. What counted as extroverted behaviour in the 1950s may seem very tame in modern society. For this reason, we need to be careful when carrying out scientific psychology.

Validity

Validity refers to the extent to which a study produces accurate results (*internal* validity) and produces results that are widely applicable (*external* validity). In our study of TV programmes and aggression, we need to know that the study does test the effects of watching TV and that our results apply in other situations as well as our own study.

Internal validity

Internal validity refers to the extent to which an experiment actually tests the hypothesis it claims to test. This is independent of the results – a valid study may not support the hypothesis, while an invalid study may do so. Internal validity depends on the logic of the study's design, the appropriateness of the measurements used and especially the adequacy of the experimental control (Rosnow and Rosenthal, 2003).

In the example of television and aggression, we may find that the group watching a violent programme does show more aggression. However, if group members were already more aggressive than members of the other group, the study really has no validity – the results aren't a test of the hypothesis but a reflection of a pre-existing difference. Similarly, asking people to say how aggressive they feel on a scale of 1 to 5 probably isn't adequate as a measurement.

External validity

External validity refers to the extent to which the results of an experiment can be applied to other situations. We may find that watching a violent programme leads to an increase in aggression in the laboratory, but would the same results be found in the real world? We usually want studies to allow generalisation, enabling us to make claims about the world in general on the basis of our findings. Studies that lack external validity only tell us about behaviour in the specific experimental setting.

There are two main threats to external validity. One results from a tradeoff between internal and external validity (McGhee, 2001). The more we try to control every unwanted factor in an experiment, to improve internal validity, the more artificial we make the experimental setting. For example, to investigate immediate memory we might ask people to learn made-up words, to control for familiarity with real words. However, in the real world, people seldom have to remember lists of invented words. Our study may have excellent internal validity but limited applicability to the real world.

The second threat to external validity comes from the people we study. If we want to explain human behaviour we can't test everyone, so we test a subset or sample instead. We hope that the sample is typical of the people we want to describe. We can only generalise our results if the sample is indeed typical or representative. If we're looking at gender differences in school achievement, we want to make claims about all girls and boys in the school system. We can't test all girls and boys, so we use a small group of children instead and we hope that they are representative. If, however, all the children selected are educated at home, then they are not representative of children in the school system and our study loses validity. Most psychology studies rely on using undergraduate students as participants, but make claims about people in general. However, studies show that students differ from the wider population, typically being young, intelligent, introspective and male (Valentine, 1992). These differences may have a distorting effect on the validity of studies as explanations of general human behaviour. (See also Chapter 39 for a fuller discussion of the use of samples.)

Self-test:
- What is the difference between internal and external validity?
- What are the two main threats to external validity?

FOCUS POINT 3.2

Artefacts in experimental research

At the start of the 20th century Europeans were amazed by a horse called Clever Hans, which seemed to be able to do maths. People would ask Hans questions (e.g. what's 2 + 2) and Hans would reply by tapping his foot (in this case, four times). Careful study showed that Hans was picking up cues from the questioner. When someone questioned Hans they would make a slight forward motion and when Hans gave the right response they would move back again. Hans would then stop tapping (Thorne and Henley, 2001). Hans' abilities showed that participants pick up on cues from investigators.

More research on participants' behaviour came from Orne, who was interested in the social psychology of psychology experiments. Orne found that participants agree to ridiculous requests in experiments. In one study (Orne 1962), participants were asked to do additions on sheets of random numbers, 224 additions on each of 2000 sheets. After 5½ hours Orne stopped the study with his participants still adding up numbers. Orne's studies seemed to show that participants want to please the investigator and so do what they're told.

A final example is a study by Rosenthal (described in Gross, 2003). Rosenthal asked experimenters to train rats to learn their way around a maze. Some experimenters were told their rats had been bred for brightness and some were told their rats were bred for dullness, despite the fact that rats had been randomly allocated to experimenters. Rosenthal found that the rats that were believed to be bright learned the maze faster than the rats believed to be dull. The difference was created by the expectations of the experimenters!

Experiments and artefacts

Scientific psychology is based on objective observation. However, it is increasingly recognised that psychology experiments are social situations and that this affects people's behaviour. Such unwanted effects are called artefacts (see Focus point 3.2). Artefacts threaten the objectivity of observations and the internal validity of experiments. They may come from subjects or experimenters.

Participant artefacts

Participant artefacts come about because participants actively try to work out the nature of the study they're involved in. Orne (1962) suggested that there are cues in an experiment (called *demand characteristics*) that give away the nature of the study. These include, for example, the instructions used in the study. Orne believed that participants try to be good participants (the *good subject effect*) and so behave as they think the experimenter wants them to.

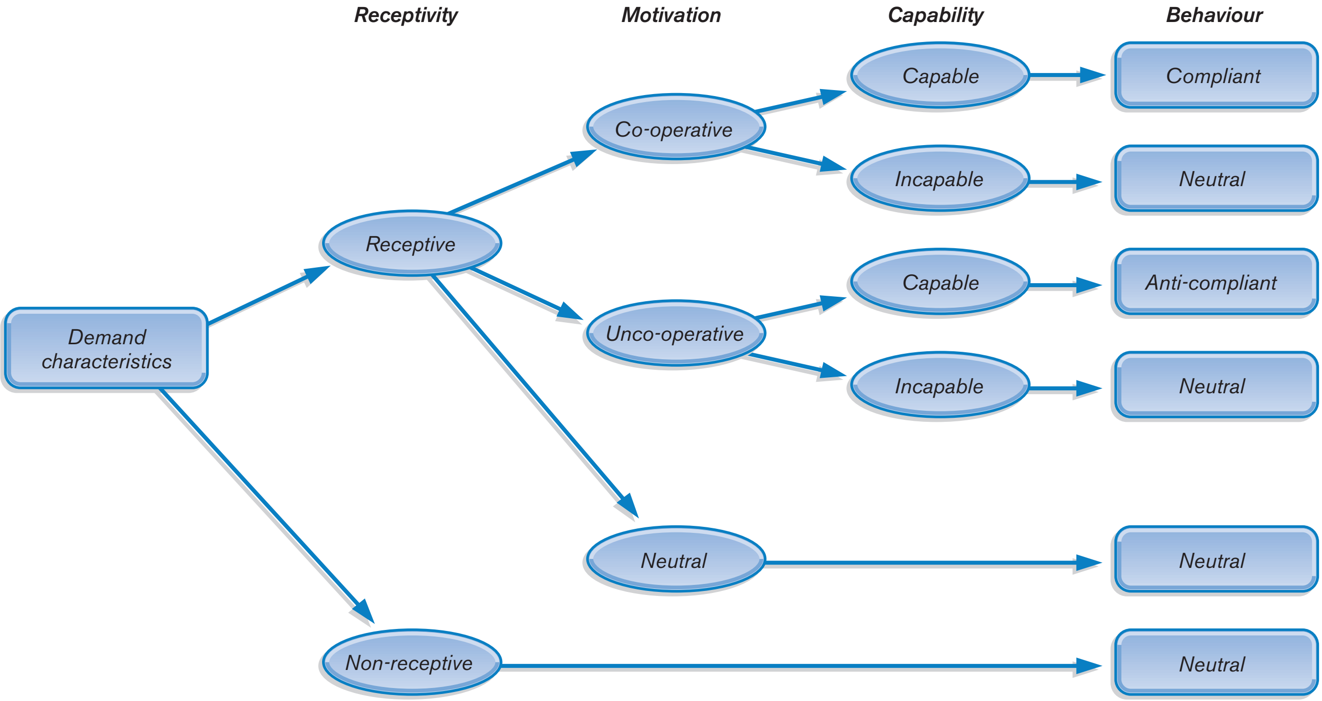


Figure 3.3 Factors influencing participant artefacts (Source: Rosenthal and Rosnow, 1991)

Why might people want to be good participants? Rosenthal and Rosnow (1991) suggest that people are motivated by altruism (a desire to be helpful), evaluation apprehension (a fear of being thought badly of) and obedience (see Figure 3.3). Participants may try to be good, they may try to be neutral or they may try to go against what the experimenter expects. However, only certain circumstances lead to participant artefacts:

- Participants have to want and be able to spot demand characteristics.
- Participants have to be motivated to respond to them, either to be compliant or anti-compliant.
- Participants have to be able to respond to the demand characteristics.

It's not important whether participants are accurate in guessing what a study is about. If they guess wrongly, but alter their behaviour accordingly, then subject artefacts will still arise.

Self-test: What are participant artefacts in research?

Experimenter artefacts

Experimenter artefacts are when features of the experimenter influence the results of a study. They threaten the internal validity of studies and pose questions about whether experimenters can be truly objective. There are several kinds of experimenter artefact, including the following (Rosenthal and Rosnow, 1991):

1. Observer These are errors of observation. Different people observe things in different ways, meaning that different investigators of the same phenomenon may produce different findings.
2. Intentional Intentional effects arise from dishonesty or

FOCUS POINT 3.3

The Case of Sir Cyril Burt

Sir Cyril Burt (1883–1971) is renowned for committing one of largest alleged frauds in the history of psychology. His case is an example of intentional experimenter effects, but also indicates the problem of bias in psychology (covered in depth in Chapter 4).

Burt was one of the most influential psychologists of his time and became chair of the psychology department at University College in 1932. He was noted for his work on intelligence, including giftedness and backwardness and more particularly the heritable basis of intelligence. Based on studies of identical twins raised apart, Burt found that the heritability of intelligence was 0.77, suggesting that intelligence was largely *genetically determined*. This research led to Burt's involvement in the establishment of a new British school system in the 1940s, which segregated children into grammar or secondary modern schools at the age of 11 based on the results of a test of intellectual ability (the '11+'). It was thought that some children were innately fitted to academic education and should be educated separately from other children.

Doubts began to surface about Burt's research with the work of Kamin (1974). Hearnshaw's (1979) biography of Burt suggested that Burt had been engaged in a large-scale fraud. The number of children tested by Burt had apparently risen from 15 pairs of twins in 1943 to 53 pairs in 1966, yet the correlation between their IQ scores remained the same to three decimal places. This was highly improbable and Kamin suggested that the data had been forged. This seemed to be supported when the co-investigators listed as co-authors of Burt's reports couldn't be found to confirm their validity. In 1980 the British Psychological Society endorsed Hearnshaw's conclusion that Burt conducted a systematic fraud and a number of academics admitted that they had harboured doubts about Burt's findings.

Since the end of the 1980s there have been a number of attempts to rehabilitate Burt (for example, MacKintosh, 1995). It is claimed that Burt's co-workers have been identified and other studies of identical twins reared apart have shown similar results to Burt's. A vigorous debate has emerged within psychology over the status of Burt's work. However, his work was destroyed shortly after his death, making the facts hard to determine. Most defenders of Burt contend that the case against Burt is unproven and that at worst Burt was guilty of carelessness in conducting and reporting research. (This would also constitute an intentional experimenter artefact according to Rosenthal and Rosnow's definition.)

The most interesting aspect of the Burt controversy is that people's views on the Burt case seem to correspond with their views on the heredity and environment debate and more widely with their political persuasion. It seems that people's views are influenced by their pre-existing beliefs. We shall see more examples of this trend in Chapter 4. The irony of the case is that Burt is often demonised as pursuing an elitist social agenda, but his writings suggest that he was motivated by egalitarian concerns. Burt strongly believed that IQ was determined by heredity, but emphasised that all children, regardless of gender, ethnicity or class, were entitled to the best education they could benefit from.

sloppiness by the researcher. The classic example of an intentional interpreter effect is the work of Cyril Burt, which is described in Focus point 3.3.

3 Interpreter These are errors in the interpretation of data. For example, researchers may interpret findings only in the light of their preferred theory.

4 Expectancy Expectancy effects occur when experimenters alter their behaviour to achieve the response they expect from a group. This changes the demand characteristics for different groups, leading to a difference in performance. For example, in a classic study (Rosenthal and Jacobson, 1968) teachers were told that a certain group of students were particularly bright, even though the students were chosen at random. The teachers' positive expectations of these students meant they behaved differently towards them, with the result that the students performed better, showing greater gains in IQ performance than the otherwise equivalent students. This particular form of expectancy effect is known as the 'Pygmalion effect', after the George Bernard Shaw play Pygmalion (on which the popular musical 'My Fair Lady' was based).

Self-test: How might expectancy artefacts affect the results of experiments?

Measurement

We have already seen that scientific psychology relies on creating measures of hypothetical constructs. For example, we might say that intelligence is measured by the number of correct responses on an intelligence test. However, there are a number of issues surrounding measurement.

The hypothetical constructs that psychologists try to measure are the creations of psychologists. We may develop measures for these constructs, but that doesn't mean they are meaningful. Richards (2002) gives the example of 'sanctity'. We might hypothesise a personality trait of sanctity and develop a questionnaire that measures how holy people are by asking about their churchgoing behaviour, donations to charity and so on. That certainly does not mean that sanctity exists as a stable personality trait!

It is said that everything that exists can be measured. However, it's not true that everything that can be measured exists. Developing a measure that seems to be successful leads people to believe that the construct exists (a process called *reification*), but this is never proven.

Another problem is that someone has to decide what counts as part of the measure. In measuring intelligence, we might count language skills as intelligent, but not interpersonal skills. Others may disagree. Measurements are also culturally and historically specific. Eysenck's (1957) Social Attitude Inventory included the item: 'It would be best to keep coloured people in their own districts.' Those who disagreed with this were seen as 'tender minded'. However, few today would agree with the statement and few psychologists would include the statement in an inventory. Measurements are devised in a specific context and may not reflect a universal truth.

It is possible to have multiple measures for the same construct. For example, there are a number of IQ tests available for psychologists to use. They all measure the same hypothetical construct, but not necessarily in the same way. The results we get from different measures may not be directly comparable.

ACTIVITY BOX 3.3

Experimental control and measurement

In Activity box 3.1, we answered questions about a study investigating the effects of watching violent television on levels of aggression.

The first question asked what other explanations there might be if we found a difference in aggression. Some possible explanations are:

1. The people in the two groups differed in their 'natural' levels of aggression. It so happened that those watching violent television were more aggressive than those watching non-violent television. The type of television made no difference.
2. The two programmes differed not only in the level of violence they contained. The violent programmes were also emotionally upsetting and it's because people got upset that they became more aggressive.
3. The experimenters gave the game away to their participants by giving off inadvertent clues. The people in the violent group picked up on the fact that they were supposed to show more violence and behaved compliantly.

For each of these possible explanations, try to think of ways in which we could use experimental control to stop these possibilities from happening, so that we can have more confidence that our results are accurate.

Activity box 3.1 also asked how we might measure aggression. Some possibilities include:

1. Observing people's behaviour; counting how many times they behave aggressively.
2. Taking physiological measures of people's arousal, for example measuring heart rate or respiration rate.
3. Asking people to fill in a questionnaire; asking them to rate their level of aggression.

Think about how good each method is. How practical is it to use? Does it really measure aggression or does it measure something else? Does it give us an accurate measure?

Before moving on to the next section, try Activity box 3.3, which will help you to think more about doing psychology scientifically.

Ethics

Psychology is largely the study of human behaviour, so we must, necessarily, conduct research on humans. In the last 30 years there has been increasing awareness of the potential of psychological research to cause harm to participants. This has led to a commitment to the idea of research ethics (see Focus point 3.4).

Research ethics covers a number of concerns. These include considering the welfare of research participants, maintaining honesty in conducting and reporting research, giving appropriate credit to others and considering how knowledge should be used. The British Psychological Society (2000) has developed ethical principles that British psychologists must adhere to.

It is essential that psychologists are ethical in their research and practice. Besides the moral responsibility on psychologists not to cause harm, the viability of psychological research depends on participants being able to trust researchers to protect them. This doesn't mean that we should not conduct research. Psychological research has the potential to increase our understanding of behaviour and leads to valuable therapeutic techniques. However, we should always ensure the welfare of those who participate in research.

(A fuller discussion of the ethical issues important to the design of good psychological research can be found in Chapter 37.)

Self-test: Why is it important to be ethical in conducting psychology research?

Alternatives to scientific psychology

In asking whether psychology is a science, one answer is to assess whether psychology meets the assumptions of science. However, the question can also mean '*Should* psychology be a science?' In other words, is the scientific way of knowing the right one for psychology? Science searches for regularities in behaviour, but some believe that discovering such regularities doesn't give us a deep understanding of the behaviour and experience of individuals (Hepburn, 2003).

We saw in Chapter 2 that there is a range of approaches to psychology. Not all of these approaches use the scientific method. Humanism rejects the scientific method because it prefers to concentrate on the richness of an individual's experience. More recently, the social constructionist approach has led to the development of new paradigm research, which uses qualitative rather than quantitative methods.

New paradigm research rejects the principles of science and instead (Barker, 2003):

- studies people in real-life settings
- uses open-ended methods, such as diaries and interviews, to gather information
- tries to incorporate the views and biases of the researcher in the research
- sees participants as collaborators in research.

FOCUS POINT 3.4

Ethics in research

Two psychology studies are commonly used to demonstrate unethical research in psychology. These are the Milgram experiment and the Stanford prison experiment, led by Philip Zimbardo.

Stanley Milgram (1963) investigated obedience to authority. Participants were told they were acting as teachers in a study on the effects of punishment on learning. Participants were shown another participant – the learner – in a cubicle, wired up to an electric shock machine. They were then taken to another room, within hearing distance, but out of sight, and told to ask the learner questions. Each time the learner got the question wrong the teacher was to give the learner a shock, increasing the shock by 15 volts for each wrong answer. Milgram was interested in how long participants would go on giving shocks if told to by the experimenter. He found that most administered potentially lethal shocks, despite hearing screams from the learner. After the study, participants were told the study was faked and that no electric shocks had been administered. The study has been widely condemned as unethical, because of the use of deception and the potential distress to participants in finding that they were capable of administering the shocks.

Zimbardo and his colleagues (Haney et al. 1973) simulated a prison, getting students to role play the parts of either prisoners or guards. The study was scheduled for 14 days. However, the guards quickly became brutal and the prisoners began to show pronounced distress, so Zimbardo cancelled the study after 6 days. Again, this study was condemned for the potential psychological harm caused to participants. The study was the basis for the BBC TV programme 'The Experiment', a reality TV programme that was also terminated early. It also inspired the 2002 German film *Das Experiment* (*The Experiment*).

One advantage of new paradigm research is that it has good external validity, because it emphasises research in the real world. However, its lack of control means it has poor internal validity and reliability and it is, thus, less successful in identifying the causes of behaviour. Because it concentrates on studying individuals it has difficulty explaining the behaviour of people in general, which for many is the goal of psychology.

There is an ongoing argument within psychology about the relative value of scientific and new paradigm approaches. There are four schools of thought (Stevenson and Cooper, 1997):

- Psychology is and should be a science. Scientific methods are appropriate, although there may be room for improvement in how these methods are used.
- We should reject the idea of psychology as a science and use new paradigm methods.
- We should use different methods for different areas of psychology. For example, cognitive psychology should be scientific, but social psychology should not be.
- We should use a mix of methods to get a richer view of human behaviour (epistemological pluralism). For example, we could use qualitative methods to get initial ideas about a phenomenon (the induction stage), but use quantitative methods to test the theories we have about the phenomenon (the deduction stage).

Self-test: What alternatives to scientific psychology might we adopt?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Explain the principles and assumptions of science.
2. Discuss how psychology can be seen as a science and how psychology's methods relate to this.
3. Evaluate issues around control, measurement, validity and artefacts and recognise the threats these pose to scientific psychology.
4. Assess the importance of ethical research.
5. Evaluate the scientific approach in psychology and alternatives to scientific psychology.

Further reading

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Richards, G. (2002) *Putting Psychology in its Place*. Hove: Psychology Press.
Rosnow, R. and Rosenthal, R. (1997) *People Studying People: Artefacts and Ethics in Behavioural Research*. New York: W. H. Freeman.
Stanovich, K. E. (2004) *How to Think Straight about Psychology*, 7th edn. London: Pearson.

Essay titles and references

1 How good a science is psychology? Evaluate the extent to which psychology is successful in meeting the assumptions and aims of science and consider whether meeting these is threatened by issues in scientific psychology.

Bell, A. (2002) *Debates in Psychology*. Hove: Routledge.
Danziger, K. (1990) *Constructing the Subject: Historical Origins of Psychological Research*. Cambridge: Cambridge University Press.
Gomm, R. (2004) *Social Research Methodology: A Critical Introduction*. Basingstoke: Palgrave Macmillan.
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2 To what extent is 'intelligence' merely that which is measured by IQ tests? Is the construct of intelligence theoretically valid, independent of how it is measured; or is it dependent on the validity of measures of IQ? Critically discuss with reference to issues in measurement.

Banyard, P. (1999) *Controversies in Psychology*. London: Routledge.
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Gould, S. J. (1997) *The Mismeasure of Man*, London: Penguin.
Henshaw, J. (2006) *Does Measurement Measure Up? How Numbers Reveal and Conceal the Truth*. Baltimore, MD: Johns Hopkins University Press.
Jones, D. and Elcock, J. (2001) *History and Theories of Psychology*. London: Arnold.
Maraun, M. (1998) Measurement as a normative practice, *Theory & Psychology*, 8(4), 435–61.
Michell, J. (2000) Normal science, pathological science and psychometrics, *Theory & Psychology*, 10(5), 639–67.
Richards, G. (2002) *Putting Psychology in its Place*, 2nd edn. Hove: Routledge.
Richardson, K. (1999) *The Making of Intelligence*. London: Weidenfeld & Nicolson.
Sternberg, R. and Grigorenko, E. (eds) (2002) *The General Factor of Intelligence: How General is it?* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

3 What are the advantages of adopting new paradigm research methods in psychology? Evaluate the utility of these methods for psychology, highlighting what benefits such methods bring in comparison to scientific methods. Are new paradigm methods worth using and, if so, how should they relate to scientific methods?

Fischer, C. (ed.) (2005) *Qualitative Research Methods for Psychologists: Introduction through Empirical Studies*. Oxford: Academic Press.
Flick, U. (2006) *An Introduction to Qualitative Research*, 3rd edn. London: Sage.
Michell, J. (2003) The quantitative imperative: Positivism, naïve realism and the place of qualitative methods in psychology, *Theory & Psychology*, 13(1), 5–31.
Prakash, A. (2001) Qualitative research: An emergent paradigm for research in psychology, *Psychological Studies*, 46(3), 101–104.
Rennie, D., Watson, K. and Monteiro, A. (2002) The rise of qualitative research in psychology, *Canadian Psychology*, 43(3), 179–89.
Smith, J. (ed.) (2003) *Qualitative Psychology: A Practical Guide to Research Methods*. London: Sage.
Smith, J., Harré, R. and Van Langenhove, L. (eds) (1995) *Rethinking Methods in Psychology*. London: Sage.
Willig, C. (2001) *Introducing Qualitative Research in Psychology: Adventures in Theory and Method*. Maidenhead: Open University Press.
Willis, J. (2007) *Foundations of Qualitative Research: Interpretive and Critical Approaches*. London: Sage.

Conceptual and historical issues

4

Bias in psychology

Route map

In this chapter, we look at the problem of bias in psychology. While psychology claims to be an objective, value-free science, we'll see that at various points it has produced theories that support inequality. We consider four main areas of bias: ethnocentrism (culture bias), androcentrism (pro-male bias), racism and also biases arising from methodology. These are particularly visible examples of bias, but the list isn't exhaustive. We could also have covered homophobia (anti-homosexuality bias) and ageism, for example, but, unfortunately, space doesn't allow full coverage. Having looked at these areas of bias, we then look at the implications of bias for psychology's claims to objectivity. We conclude by considering some ways in which the problem of bias can be tackled.

Introduction

In Chapter 3, we looked at psychology as a science. A key element of science is that observations are conducted objectively and theories are developed objectively. However, can psychology, as the study of humans, be objective? There's a growing recognition of the potential for bias in psychology. Such bias threatens psychology's claims to objectivity and hence to being a science. It also threatens the validity of psychological theories and can have unfortunate consequences for the victims of bias.

In this chapter, we look at the problem of bias in psychology. We start by looking at a number of ways in which bias may be manifested, before identifying some general points about bias. We then consider the implications of these for whether psychology can be objective and think about how we can tackle the problem of bias.

Ethnocentrism

Ethnocentrism occurs when we see things from our own cultural viewpoint as the norm and see things from other cultures in comparison to this norm. In psychology, this means that psychologists have tended to adopt western (American and European) values and these have shaped the theories and studies developed by psychologists. Ethnocentrism is exhibited in a number of ways:

- Most research studies in psychology are conducted in the USA and most research described in psychology textbooks is American – over 90% in American textbooks and over 60% in European textbooks (Smith and Bond, 1998). In addition, non-western research is rarely reported.
- This American research concentrates on studying American participants. This is the group of most interest to the researchers and those who fund research and American participants are more readily available to study.
- Most studies involve undergraduate students, who themselves aren't representative of the American population (see Chapter 3).
- It is assumed that the results of these studies can be generalised to all humans in all cultures. This isn't a safe assumption – different cultures may show very different results (Smith and Bond, 1998).
- Western psychologists have tended to assume the superiority and desirability of western values. For example, theories of development such as Maslow's (see Chapter 2) emphasise the need to achieve independence, but independence is less desired in collectivist societies that value self-sacrifice.

Search for universals

As a result of these features, psychology is, to a large extent, the science of young white Americans. Psychology says little about other groups specifically and, when it does, it tends to do so in negative terms, as we shall see. This comes about partly because psychologists are trying to find universal aspects of human behaviour. If we're finding universals, then it doesn't matter what participants we use. However, the problem with this is apparent when we consider the concept of 'self'. The idea of self is

ACTIVITY BOX 4.1

What is psychology the science of?

It has been suggested that psychology is the study of white, middle-class men. Discuss the validity of this claim and decide why, if true, it might constitute a problem for psychology.

One significant source of bias in psychology is ethnocentrism, arising from a concentration on studying western participants and assuming that the results from these either constitute a norm from which other cultures diverge; or accurately describe universal aspects of human nature. However, we saw in Chapter 3 that using a restricted sample of participants compromises the external validity of psychological research. This discussion points asks you to consider whether psychological theories are threatened in this way.

There are two main issues you need to discuss. For the first issue, you need to evaluate the claim that psychology is the study of 'white, middle-class men'. The claim itself is in three parts and should be addressed as such, hence participants may tend to be white and middle class, but not necessarily male. Apart from the material in this chapter, you should look over the research presented elsewhere in the book to evaluate the claim.

Whatever the extent to which you believes the claim to be supported, you should then go on to discuss why this might be a problem for psychology. This discussion should be in terms of the nature of scientific psychology, as described in Chapter 3, and the implications for this of a restricted sample set. The main concern therefore will be about representativeness and generalisation. Within this there are issues around whether psychology can be a universal study of mind and behaviour. Clearly, if psychology is studying universal aspects of behaviour, then it can be said with some justification that any set of 'normal' subjects is as good as any other. However, if psychology's object of investigation isn't universal then there may be problems with representativeness.

fundamental to western views of human nature – although this is relatively recent (see Richards, 2002) – and has led to an emphasis in psychology on individuality and individual differences (Jones and Elcock, 2001). However, other societies place a greater emphasis on the survival of the group. In these societies, psychology would be more likely to emphasise group membership and similarity (Banyard, 1999).

Ethnocentrism arises because we identify with people like ourselves (our *in-group*) and tend to overvalue the outputs of our in-group (see Activity box 4.1). Against this, we tend to undervalue the outputs of people unlike ourselves (the *out-group*) and show hostility towards out-group members (Banyard, 1999). Because of this, ethnocentrism is, to an extent, inevitable; however, awareness of it can help us to avoid enshrining it in psychological theories.

Self-test:

- What is ethnocentrism?
- In what ways is ethnocentrism exhibited in psychology?
- Why does ethnocentrism arise?

Androcentrism

Androcentrism means a 'male-centred' approach. Traditionally, psychology has been dominated by male researchers studying male participants. It has been assumed that results from studies of male participants will simply generalise to females and little research has been conducted into women's experiences. A considerable amount of work has been done on gender differences (Etaugh and Bridges, 2004), but this has usually taken the androcentric view that women are inferior to men (see Focus point 4.1; Photo 4.1).

Photo 4.1 Are gender roles the result of fixed biological differences, or are they determined by society?

Search for differences

Difference research investigating gender is an example of a common approach to psychology, which emphasises the search for differences. Psychological similarities between men and women outweigh psychological differences (Barker, 2003), but few psychologists investigate similarities. In part, this reflects the fact that research that finds differences is more likely to be published than research that finds similarities. However, there is also a long history of psychology belittling women. Representations of women within psychology include Erikson's view that women's self-concept is defined by their attractiveness and the search for a mate, while Freud accused women of being 'the problem' (Banyard, 1999). In general, psychological theories

FOCUS POINT 4.1

Kohlberg’s theory of moral development

Kohlberg (1968) investigated the development of moral reasoning using responses to a set of problems. For example he referred to a man named ‘Heinz’, who couldn’t afford to pay for drugs to save his wife’s life and so steals the drug. Kohlberg asked boys of different ages what they would do in his place and identified three stages of moral development:

- Pre-conventional morality. The child responds to other people’s definitions of good and bad.
- Conventional morality. The child internalises the rules of society.
- Post-conventional morality. The child develops his own well thought-out ethical principles.

There are two biases in Kohlberg’s theory. First, male values are given higher status than female values. Kohlberg assumed that men had better moral reasoning than women and that women couldn’t reach the highest stage. However, Kohlberg didn’t actually study women so had no evidence on which to base such claims.

The second bias is a cultural one. Kohlberg conducted a number of cross-cultural studies of moral reasoning and found, not surprisingly, that American boys were more morally advanced than boys from other cultures. This probably reflects the culture-specific nature of Kohlberg’s tests more than any real moral superiority of American children.

have tended to characterise women as a problem or as wives and mothers.

Problems of difference research

A common failing in sex difference research is that any differences that are found between men and women are ascribed to the biological basis of their sex. No account is taken of socialisation and of the different experiences of men and women. The implication of this is that if gender differences are caused by biological sex, then such differences are unchangeable. By the same token, accounting for any differences found between genders in terms of socialisation may suggest changes to society to address inequality. This is the project of feminist psychology (discussed later under the heading ‘Tackling bias in psychology’). The key point here is that any research on sex differences is quasi-experimental and as such does not allow us to ascribe causality (see Chapter 3). Whether we ascribe gender differences to biological sex or to socialisation depends on our own preferred form of explanation.

A common aspect of sex difference research is that it often starts from the assumption that males are the norm. Many of the classic studies in social psychology were

FOCUS POINT 4.2

Talking about gender

Tavris (1991) identified a number of conclusions that have been drawn from research on sex differences:

- Women have lower self-esteem than men.
- Women value their efforts less than men.
- Women are more likely to say they’re hurt than admit they’re angry.
- Women have more difficulty in developing a sense of self.

Tavris noted that the way these conclusions are phrased present women as deficient compared to a male norm. She highlighted this by rephrasing the conclusions:

- Men are more conceited than women.
- Men overvalue the work they do.
- Men are more likely to attack others when they are unhappy rather than describing their hurt and seeking support.
- Men have more difficulty than women in forming attachments.

Phrasing the conclusions in this way gives a very different impression of the research results. The difference isn’t that one way is right and one is wrong. The difference between the two sets of phrases shows the importance of perspective in interpreting the results of psychology research.

carried out on male participants, including Kohlberg's theory of moral development and Erikson's model of identity (Kitzinger, 1998). These studies established what was considered normal and when women differed from this they were considered to be deficient. However, when differences do exist there's no reason, except for one's own personal values, to choose one as 'normal' and another as 'deficient'. This point is highlighted in Tavris's (1991) reformulation of some classic claims from sex difference research (see Focus point 4.2).

Androcentrism in psychology raises concerns about the validity of theories about 'universal' human nature, when the theories are based on a male perspective. In addition, however, psychology's failure to investigate women also led to a failure to understand the particular experiences of men. Gender-biased research is clearly damaging to women, but also to men – for example, when research suggests that only women should care for children (Barker, 2003).

Self-test:

- What is androcentrism?
- How have psychological theories tended to characterise women?
- Why does gender difference research not allow us to ascribe causality?

Racism

The issue of racism should not, sadly, need a definition. It is clear that in the past psychology has produced racist theories. One example is Yerkes's mental testing of army recruits (see Focus point 4.3). More generally, racism in psychology is illustrated by the project of scientific racism, defined by Banyard (1999: 86) as 'the attempt to justify racial policy through the use of bogus scientific arguments'. Scientific racism claims to find biologically founded differences between races on psychological variables. The approach has a history stretching back to the 19th century and is based on a number of assumptions:

- Different races exist and have been engaged in an evolutionary contest.
- The contest is over, races can't develop any further and whites have 'won'.
- Compared to whites, other races are in a state of arrested development.

Scientific racism believes that there's nothing policymakers can do about these biological 'facts'. In this view, 'lower races' may be better on 'primitive' characteristics, such as reaction times, but are behind 'higher races' on 'civilised' characteristics, such as intelligence, and always will be.

The assumptions of scientific racism and their basis in scientific fact have been widely disputed (see, for example, Richards, 1997). Despite this, scientific racism seems to have an enduring appeal.

FOCUS POINT 4.3

The Army's alpha and beta tests

When the USA joined the First World War in 1917, American psychologists applied themselves to helping the war effort. One contribution came from Robert Yerkes, who developed group tests of intelligence that were intended to categorise new army recruits into career roles. These tests were known as the Army alpha and beta tests. The alpha test was a written test for literate recruits, while the beta was a pictorial test. The tests were administered to a total of 1.7 million new army recruits and were seen as a great success, despite not actually having much of an effect on the military (Jones and Elcock, 2001). However, Gould (1982) describes a range of problems with the tests themselves and with the interpretation of the test findings.

Gould found that the tests were maladministered, for example illiterate recruits were often required to take the alpha test. Even on the pictorial form of the test, illiterate and immigrant recruits were required to use a pencil and do sums, which were usually unfamiliar skills. The tests themselves were heavily culture biased, asking more about knowledge of American culture than intellectual reasoning. One written question asked 'Crisco is a: patent medicine; disinfectant; toothpaste; food product.' One pictorial item asked respondents to draw in the missing item on a picture of a tennis court with no net. These items clearly required knowledge of toothpaste and tennis, which recent immigrants, for example, may well not have had!

Unsurprisingly, the results of the test showed strong correlations between IQ scores and length of schooling and between IQ scores and length of residence in the USA. Both of these findings clearly point to an environmental effect on scores. However, the tests were interpreted as providing evidence for racial differences in intelligence. For example, blacks were shown as scoring the least. This result can be explained readily given that in the USA at the time education was segregated and blacks had considerably less schooling than whites. However, Yerkes and his colleagues preferred to claim evidence for innate racial differences in intelligence.

TABLE 4.1 **SELECTED RESULTS FROM RUSHTON, 1990**

Characteristic	Mongoloids	Caucasoids	Negroids
'Excess neurons'	8.90m	8.65m	8.55m
Age of walking	Slow	Medium	Fast
Age of first intercourse	Slow	Medium	Fast
Age of first pregnancy	Slow	Medium	Fast
Life span	Long	Medium	Short
Aggressiveness	Low	Medium	High
Sociability	Low	Medium	High
Law abidance	Low	Medium	High
Mental health	High	Medium	Low

Source: Banyard, 1999

Durability of scientific racism

Scientific racism was common from the late 19th century up to the 1930s, when the excesses of the Nazi regime in Germany made it taboo to advocate scientific racist policies (Jones and Elcock, 2001). In part, they reflected the social context of the time: many people implicitly believed in racial differences. If scientific racism could be dismissed as a historical anomaly, then it would be less of a concern. However, what would you make of an article that claimed to find differences between three races, as shown in Table 4.1? You might think that this must be quite an old example. However, this research was published in *The Psychologist* in 1990 (Rushton, 1990).

Problems with scientific racism

The defence of scientific racism is based on the claim that the research scientific racism is based on is objective and the data must speak for themselves. Scientists, it is suggested, should not have to suppress scientific fact to satisfy societal concerns. However, a number of problems have been identified with scientific racist research (Banyard, 1999):

- There are problems in defining race. The concept of race has no biological reality – it is a socially defined construct (see later).
- There is much more variation within each racial group than there is between racial groups.
- It has been impossible to get comparable samples of people from different races to compare, which would allow us to discount other factors (see Chapter 3).

What these criticisms amount to is that while we might find differences between socially defined groups, these differences could be caused by a number of social factors. We have no real justification for claiming differences are caused by biology. We can observe that the distribution of genes that determine skin colour has no particular correspondence with the distributions of genes for other physiological characteristics (Richards, 1997). As a society, we decided at some distant point in the past to use skin colour to categorise people into groups we call 'races' (hence race as a socially defined construct), but we could equally have used eye colour or hair colour. The implication of this is that it's difficult to claim that there might be a biological correspondence between skin colour and, say, intelligence. Despite this, scientific racist claims continue to be made in psychology (e.g. Rushton and Jensen, 2005). (See Activity box 4.2.)

Self-test:

- How might we define scientific racism?
- What assumptions underpin scientific racism?
- What problems can we identify with scientific racist research?

ACTIVITY BOX 4.2

Evaluating scientific racism

Table 4.1 shows some selected results from Rushton's (1990) article in *The Psychologist*. Rushton's purpose was, first, to argue a case for *neoteny* and, second, to argue that races differ in how advanced they are. Neoteny is the idea that evolution has extended the period of childhood in humans compared to our ancestors. Most animals are born with fully formed brains, but primates continue some brain development after birth. Chimpanzees continue to show brain development for 9 months after birth. Human brains, by the same token, continue to develop into the late teens. This extended period of brain development gives us great adaptability, because the brain is able to shape itself to the environment (which has implications for the nature–nurture debate discussed in Chapter 5). The idea of neoteny is not widely disputed. What is controversial is the claim, advanced by Rushton in his article, that different races differ in the degree of neoteny they display. Those with more neoteny, that is a longer childhood, are seen as more evolutionarily advanced than those with a shorter childhood. Rushton's purpose then is to show that races differ in the length of their childhood, and hence in how advanced they are.

Rushton's article has been criticised as being 'academically shallow but openly racist' (Banyard, 1999: 85). Certainly, it's worth thinking critically about the basis of Rushton's research. Think about the following questions:

- Rushton divides the world's people into three races. Do you think this classification is appropriate? How else might we classify race? Why might Rushton have chosen only three races?
- Rushton has chosen an eclectic set of variables to consider. Why do you think he's chosen the variables shown in the table?
- The article claims that differences in the variables listed are the result of biological differences. Can you think of any alternative reasons for Rushton's results? For example, what environmental reasons might account for the low average lifespan of 'negroids'?

Methodological bias

The examples of bias discussed previously in this chapter arise from the views of psychologists. These views may directly affect what psychologists say, but may also influence the way they go about doing research. In addition, the research methods used by psychologists introduce a source of bias themselves.

Observation and theory

The hypothetico-deductive method (see Chapter 3) suggests that researchers should observe phenomena and induce theories on the basis of these observations. The theories developed can be used deductively to develop hypotheses, which are tested by conducting research to produce certain data. The idea is that this is conducted in an objective way. However, it is impossible to interpret our observations of phenomena in an 'objective' way, to see things as they really are, even in terms of basic perception.

As a simple example, look at Figure 4.1. What do you see? It's likely that you can't help but see a triangle, even though no triangle is there. How we interpret our observations depends on our existing knowledge, experience and expectations. These expectations include a number of things. In the case of observing psychological phenomena, our expectations include any pre-existing theories we hold and also pre-existing beliefs. This also affects how we interpret the results of our studies. When we test our predictions, we need to decide what our results mean. This will be affected by what we expect and want the results to mean.

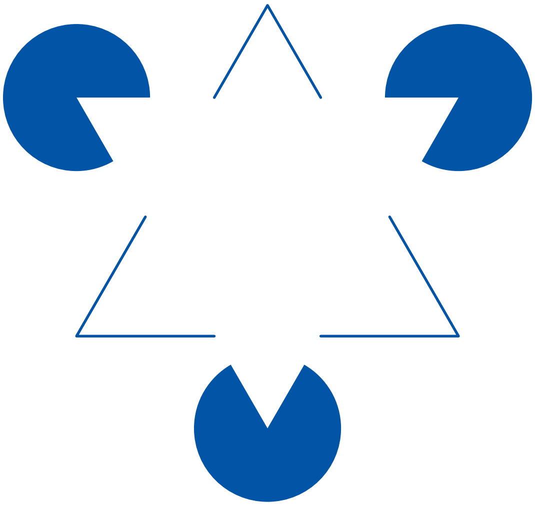

Figure 4.1 Kanizsa's triangle: most people will see a triangle even though there isn't one, showing how perception is influenced by experience and expectations

Constraints of methods

The kinds of method used by psychologists introduce a source of bias because they constrain the kinds of things psychologists can find out about. If we're committed to basing our thoughts on evidence, then we can only think about what we've got evidence for. Different research methods give us different kinds of information, but the 'gold standard' for research in psychology is the experiment. Experiments involve looking for differences between groups. Therefore, psychology becomes a *study of differences*. As Richards (2002: 259) puts it: 'When the only tool you have is a hammer everything begins to look like a nail.'

This preference for difference studies is illustrated by the number of studies looking at differences between genders and the absence of studies looking at similarities. It's also illustrated by the tendency for journals to publish articles that show a statistically significant difference, but not to publish articles that fail to show such a difference. The reason for this preference is probably that science is seen as a search for cause-and-effect relationships. Using controlled experiments is the only way of showing such relationships with confidence. However, concentrating on showing differences means that there are things that psychology doesn't investigate. The temptation is to assume that such things aren't of interest to psychology, just as behaviourism did with mental processes.

Self-test:

- How does observation introduce bias into psychology?
- How does the use of experimental methods lead to bias in psychology?

Psychology and objectivity

The problems of ethnocentrism, androcentrism and racism show that psychology sometimes represents the interests of one group over those of others. Richards (1997) suggests that psychology is made up of a number of *constituencies*. This means that different kinds of people are included in the discipline – for example, white middle-class men or lesbians. These people often represent the interests of their constituency.

At the start of psychology's history, psychologists were overwhelmingly white middle-class heterosexual men and their theories reflected the concerns and interests of white middle-class heterosexual men. An example of this comes from early studies of intelligence, which investigated gender and racial differences in intelligence. White male psychologists found, unsurprisingly, that white men were more intelligent than other groups (Gould, 1997). In general, the group of white middle-class heterosexual men was seen as the norm and their privileged position in society was seen as the natural state of affairs.

Theories from this time often tried to show why this state of affairs was natural. Over time, the constituencies represented by psychology have widened, as women and members of minority groups have entered the discipline. This change is reflected in growing awareness of the problem of bias and changes in the kinds of theory psychology produces. However, there are still structural problems in the discipline that suggest the problem of bias needs to be taken seriously.

Problems in the conduct of psychology

The areas of bias we've covered so far in the chapter show specific examples of bias in action. By examining this biased research, we can draw out a number of features of psychology research that may introduce or reinforce bias. These include the following.

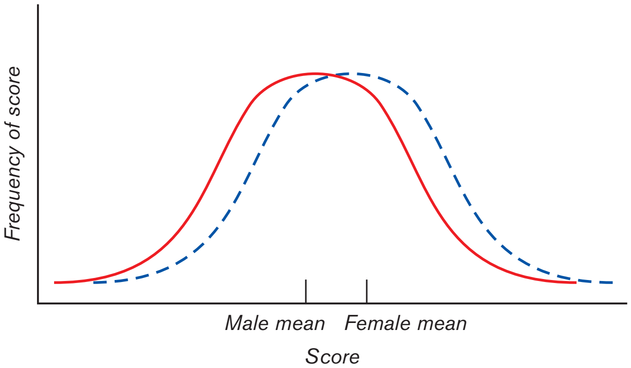

Figure 4.2 Distributions of scores for the invented measure of 'binkiness': the distributions show a small difference between males and females, but a considerable difference within each group
Source: Banyard, 1999

Using hypothetical averages

Studies find the average performance of a group of people and base findings on this hypothetical average. However, this average performance may not correspond to any particular individual.

Generalising from samples

Psychology research involves taking a group of participants and generalising from them to the population as a whole. This is only reasonable to the extent that the sample is representative.

Emphasising between group differences

Experiments involve looking for differences between the average performances of groups. However, the results usually say little about the variation in performance within groups. Women may score between 85 and 145 on a (invented) measure of 'binkiness' (Banyard, 1999), with an average of 105. Men may score between 84 and 144, with an average of 104. There's a difference between the groups, but this is much smaller than the differences in performance within each group (see Figure 4.2).

Ignoring minority groups

When studies rely on a hypothetical average of a group, that average will reflect the majority members of the group more accurately than it will minority members of the group. If, for example, we're looking at differences in intelligence between men and women, our group of men might include 50 young men with an average IQ score of 105 and 10 older men with an average IQ score of 110. The average IQ score for men as a group will be 106, but this isn't really a fair reflection of the performance of the older men. In general, when particular groups (based on race, class, handedness or whatever) represent a minority within a larger group, then

ACTIVITY BOX 4.3

Thinking about heterosexism

This chapter describes biases arising from ethnocentrism, androcentrism and racism. Another form of bias is **heterosexism**. This is when heterosexuality is treated as a norm and homosexuality is seen as deviant. Heterosexism in psychology is illustrated by the fact that until 1974 the American Psychological Association's manual for the classification of mental illness, the DSM, included homosexuality as a sexual deviation. Similarly, it took 9 years and four attempts to establish a Lesbian and Gay Psychology section of the British Psychological Society (Kitzinger and Coyle, 2002). This heterosexism is apparent in a number of classic theories within psychology. For example, Erikson's theory of lifespan development includes seeking 'relationships with a partner of the opposite sex'.

Review the description of Freud's psychoanalytic theory in Chapter 2. How does Freud's theory reflect heterosexism in psychology? Can you think of other examples of heterosexism in psychology?

that minority is likely to be under-represented by the results of the group as a whole.

Adopting a group as a norm

Difference studies may implicitly or explicitly identify one group as a norm and see differences between groups as a failing of the other group. As we have already seen, this is common in studies of gender differences, where the male performance is seen as normal and the female performance, if it differs, is seen as deficient.

Believing in fixed differences

Where differences are found, these are often interpreted as being fixed. Alternative interpretations that allow the possibility of change may be ignored.

Ascribing causality

The logic of the experiment says that if we control all factors other than the factor we manipulate, then we can ascribe causality. However, in quasi-experimental studies we cannot ascribe causality if we find a difference. We can only say there is a difference and use reasoning to explain the difference. This reasoning will be affected by our pre-existing theories and beliefs.

Self-test:

- How is psychology shaped by the constituencies represented within it?
- What features of psychological research reinforce bias?

Tackling bias in psychology

From what we've covered so far in the chapter, it's easy to see how bias can be introduced into psychology studies (see Activity box 4.3). This is most worrying when psychology influences social policy – for example, when theories of intelligence influence schooling policy. Psychologists may claim that in conducting objective science, they aren't responsible for any policy effects of their theories. They might claim that they are only involved in finding facts and it's up to politicians, who make policy, to decide what should be done with those facts. However, given concerns about the extent to which psychologists can be objective and the extent to which they make interpretations of ambiguous evidence rather than finding guaranteed facts, it is important that we try to eliminate bias as much as possible. There are a number of ways of doing this. One is to do scientific psychology better, to prevent bias creeping in. Another is to tackle psychology in different ways.

Improving scientific methodology

There are a number of ways in which we can do scientific psychology better and these are related to the problems discussed in the sections on methodological bias and psychology and objectivity, above. They include:

- not over-interpreting the results of quasi-experimental studies – a quasi-experiment may find a difference between groups, but this does not prove a causal relationship
- ensuring that samples are representative – in some cases, undergraduate students may be representative of the population, but, in many cases, they will not be
- not overstating the population – given a particular sample, we should limit claims to the population that is represented by that sample; if we've only tested males, then our results only apply to males
- looking for similarities as well as differences – psychologists prefer to look for differences because of the desire to ascribe causality; however, this means not investigating a range of phenomena in psychology
- considering effect sizes – reports of difference tests usually concentrate on whether a result is significant or not; however, this says nothing about how big a difference there is between groups and the difference may be very small; reporting effect sizes, which indicate the size of the difference, allows us to make a judgement about how meaningful a result is (Thompson, 1999)
- recognising the effect of values on interpretation – because of the desire to be objective, scientists usually say nothing about their own value systems when reporting on research; arguably, this makes more sense for the physicist, who probably doesn't care what the accelerative force of gravity is, than it does for the psychologist; being open about our own values makes it

easier for others to interpret our claims (Thompson, 1999).

Self-test:

- What threats does the presence of bias pose to scientific psychology?
- How does the presence of bias challenge psychology's claims to be an objective science?
- How can we improve scientific methodology in psychology to eliminate bias?

Adopting an alternative approach

There is currently a growing recognition of the need to improve research practice in psychology, as described in the previous section. However, some psychologists reject the use of the scientific method entirely and adopt alternative approaches. One such approach is that of cross-cultural psychology. Cross-cultural psychology assumes that culture is a key independent variable. It seeks to investigate differences and similarities between cultures, to identify which behaviours are culture bound and which are universal (Gross, 2001).

Another alternative approach, which adopts a social constructionist perspective, is feminist psychology. Kitzinger (1998) states that this is based on two assumptions:

1. women are worthwhile human beings, worthy of study in their own right
2. social change is necessary to improve the situation of women.

The view that psychology can be an agent of social change runs entirely counter to the idea of psychology as an objective, detached science. For feminist psychologists, psychology should be active and engaged in social issues.

The idea that psychology should be engaged in social issues is supported by Howitt and Owusu-Bempah (1994). They assert that bias must be rooted out at individual, institutional and cultural levels. For example, individuals should strive to become sensitive to their own and others' biases, should empathise with the victims of bias and should decide actively to resist bias rather than ignore it. The need to tackle bias is seen as a moral obligation.

Self-test:

- How does cross-cultural psychology address bias?
- What are the assumptions underlying feminist psychology?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the issue of bias and the threat it poses to objectivity in psychology.
2. Assess how ethnocentrism affects the validity of theories in psychology.
3. Evaluate the impact of androcentrism and racism on psychology's treatment of diverse groups in society.
4. Discuss how bias can be introduced into scientific methodology in psychology.
5. Describe ways in which we can tackle the problem of bias in psychology.

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Essay titles and references

1 Authors such as Jensen and Rushton argue that they are merely presenting facts about intelligence. Critically discuss whether or not it is fair to label their work as racist. Consider the claims of scientific racists about their work and evaluate whether they are presenting 'facts' or whether their theories show evidence of bias.

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2 How can we reduce the incidence of bias in psychological research? Consider where bias comes from in psychology research and evaluate steps we might take to eliminate these sources of bias.

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Hepburn, A. (2003) *An Introduction to Critical Social Psychology*. London: Sage.

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Richards, G. (1997) *Race, Racism and Psychology: Towards a Reflexive History*. London: Routledge.

Stainton-Rogers, W. and Stainton-Rogers, R. (2001) *The Psychology of Gender and Sexuality: An Introduction*. Maidenhead: Open University Press.

Unger, R. and Crawford, M. (2003) *Women and Gender: A Feminist Psychology*, 4th edn. London: McGraw-Hill.

Yanchar, S., Gantt, E. and Clay, S. (2005) On the nature of a critical methodology, *Theory & Psychology*, 15(1), 27–50.

3 How does lesbian and gay psychology challenge heterosexism in the discipline? Assess the claims that lesbian and gay psychology makes about the nature of 'mainstream' psychology and evaluate its suggested methods and theories. Does lesbian and gay psychology present a valuable alternative to mainstream approaches?

Clarke, V. and Peel, E. (eds) (2007) *Out in Psychology: Lesbian, Gay, Bisexual, Trans and Queer Perspectives*. London: John Wiley & Sons.

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Conceptual and historical issues

5

Issues and debates in psychology

Route map

This chapter introduces three key debates in psychology that shape the kinds of approach psychologists use to understand human nature. The chapter is divided into four main sections. It begins with an overview of how issues arise in psychology and the ways in which psychologists choose a position in debates. It then goes on to look at reductionism and its value, free will and determinism and the nature–nurture debate. These topics have been chosen because they affect the fundamental purposes and methods of psychology, and psychologists' views of human nature. Understanding the nature of these debates, and where different psychologists stand in regard to them, is critical for evaluating the theories in psychology that we'll see later in the book. In addition, understanding the debates will help us to evaluate the claims about psychology that are made in everyday life.

Introduction

We saw in Chapter 2 that there are a number of different theoretical approaches in psychology and each provides a different kind of explanation of the same psychological phenomena. Why are there so many different approaches? You might think that psychology would have developed a standard approach to investigating phenomena. There are a number of reasons why it hasn't. One is that different psychologists are trying to achieve different things. For example, some may be trying to develop therapeutic techniques, while others are striving to explain the structure of memory. Related to this, different psychologists try to explain things at different levels, as we saw in Chapter 2. Another reason why there are a number of different approaches to psychology is that there are some key philosophical issues that psychologists disagree on. These issues influence our views of human nature and also affect how research is conducted. In this chapter, then, we'll look at some of the major debates in psychology.

Overview of issues and debates

A number of key philosophical issues divide psychologists. These include:

- reductionism and its appropriateness
- free will and determinism
- heredity and environment.

An individual's viewpoint on these issues affects their conception of human nature, their view of how to explain behaviour and their choice of methods and interpretation of evidence. In order to understand the complexity of psychology and particularly in order to appreciate why there may be several competing theoretical explanations of a given phenomenon, it is necessary to understand these issues.

The difficulty psychology as a discipline faces is that these issues lack objective criteria for resolution. How, then, do psychologists choose a position on a particular issue? This is a question that is often overlooked. It is taken for granted that disagreements occur. However, by looking at the factors influencing psychologists' choice of position on these issues we can get a better understanding of the nature of psychology. This is one reason why it can be useful to study the history of psychology, since studying developments in its past can help us to understand these factors (Richards, 2002). Understanding the basis of a particular position and its effect on the theories that are developed can also help us to assess the validity of theories in psychology. The kind of approach psychologists take and the kind of theories they develop depend in part on their view on these issues.

A full discussion of these factors is beyond the scope of this book, but they will be considered briefly, as relevant, when considering particular issues and particular theories. The suggestions for further reading at the end of the chapter give more thorough coverage. In general, however, we can say that a range of factors outside the discipline of psychology itself will affect a psychologist's views on these issues. Such factors include the socio-cultural context, political beliefs, the background of the theorist, sources of funding and practicality (Jones and Elcock, 2001).

Self-test: How do psychologists choose positions regarding issues and debates in psychology?

Reductionism

Reductionism is a general term referring to a view that complex phenomena can best be understood by reducing them to separate, simpler parts. In psychology, reductionists may claim that only a single level of explanation is necessary to explain human behaviour.

Types of reductionism

The term reductionism can be used in a number of ways. Malim and Birch (1998) identify four types of reductionism, which will be discussed briefly here.

Physiological reductionism

Physiological reductionism is the general view that psychological explanations can be replaced by physiological explanations. The particular aspect of physiology varies, but most commonly is either that of brain functioning or of genetics. Recently there has been some merging of these two levels, such that Steven Rose (1998) talks of neurogenetic determinism, the idea that behaviour is determined by a combination of brain operation and genetic inheritance. This form of reductionism is particularly amenable to scientific explanation and it provides (relatively) simple explanations of psychological phenomena. Since we are biological organisms, we assume that there is a neurophysiological basis for behaviour and, hence, potentially we can explain all behaviour in neurophysiological terms.

Physiological reductionism has had considerable success, as we saw in Chapter 2 when we considered the physiological approach to psychology. For example, schizophrenia is thought to be due to a malfunction of brain chemistry (particularly a surfeit of dopamine). This explanation has led to successful treatment. However, there are some problems with this explanation. In particular, it doesn't explain what led to the high levels of dopamine (there could be an underlying biological or environmental cause of this). Relatedly, it cannot explain why in Britain black males are 10 times more likely to develop schizophrenia than white males and why the pattern may be different in other cultures. (See Chapter 33 for a fuller discussion of these issues.)

Biological reductionism

Biological reductionism attempts to explain human behaviour in terms of less complex animals. This approach has been an important one throughout the history of psychology, including late 19th-century comparative psychology, behaviourism and *ethology*. Modern biological reductionism comes in the form of *sociobiology* (Wilson, 2000), which searches for evolutionary origins of behaviour and studies less complex animals to identify which behaviours may be genetically determined. Biological reductionism in its various forms has contributed greatly to the development of psychology and our understanding of human nature. However, a potential difficulty of the approach is that it assumes a continuity of behaviour between humans and lower animals, such that humans share a behavioural repertoire with less complex animals. Not everyone accepts this, claiming that just as humans are *physiologically* different from other species (for example, we stand on two legs), so humans are also different *behaviourally* (Malim and Birch, 1998).

Self-test: What is sociobiology?

Experimental reductionism

This is more an issue of methodology than philosophy and hence a different kind of issue. Experimental reductionism attempts to isolate particular factors influencing behaviour and study the effect of those factors in isolation. This reflects the issue of experimental control discussed in Chapter 3. The view is that the particular behaviour can be explained solely in terms of those factors. As an example, a psychologist might study the effect of noise on memory for wordlists and ask one group to remember a wordlist in a quiet environment and another group to remember the list in a noisy environment. As we saw in Chapter 3, applying experimental control can lead to a loss of external validity for the sake of internal validity. However, strong internal validity is necessary if psychology is to produce precise and rigorous scientific theories (Malim and Birch, 1998).

Machine reductionism

Machine reductionism is the use of computer models to explain psychological phenomena, particularly in the area of cognitive psychology. Many theories in cognitive psychology are based on the *mind as computer* metaphor. The application of computer modelling has produced a number of impressive simulations, particularly in the area of problem solving (Malim and Birch, 1998). However, there are some important differences between humans and computers that need to be borne in mind. For example, humans are conscious and forgetful, while computers are neither.

Self-test:

- What does the term 'reductionism' refer to?
- What types of reductionism can we identify within psychology?

Reductionism and levels of explanation

There is an alternative way of conceiving of reductionism, which is in terms of levels of explanation. Rose (1998; see Photo 5.1) suggests a hierarchy of sciences, corresponding to different levels of explanation (see Table 5.1). Sciences lower down the hierarchy are seen as more scientific than those higher up. Reductionism can be seen as an attempt to explain phenomena at a given level in terms of levels below

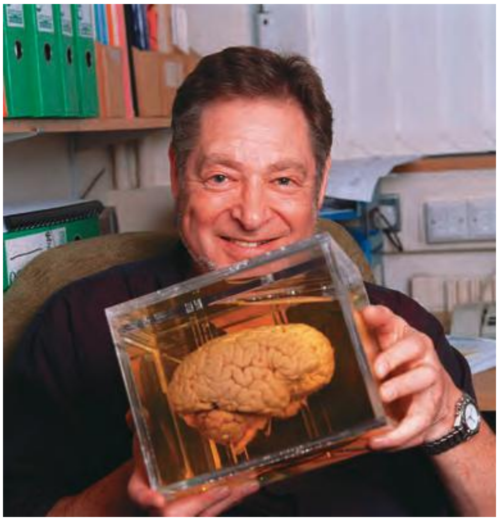

Photo 5.1 Steven Rose is a leading British critic of reductionism in psychology.

(see Activity box 5.1). For example, physiological reductionism attempts to explain psychological phenomena (such as extroversion) in terms of physiology (brain operation) or biochemistry (genetics). One attraction of reductionism is that it suggests that we can provide more scientific explanations of behaviour by explaining things at a lower level of the hierarchy. In line with this, the physicist James Watson once remarked: 'There is only one science, physics: the rest is just social work.'

Any given phenomenon in psychology can be explained using any level of the hierarchy. As an example, consider the explanation of a handshake. This can be explained in many ways, including the social role fulfilled by a handshake, the thought processes underlying the physical act, the physiological processes necessary to make the hand move, the chemical state of the brain and body tissue at the time and so on. The question is: what is the most suitable level of explanation? Although it is possible to explain a handshake in terms of physiology, in psychology it might be more important to concentrate on *why* people shake hands.

Psychology asks two kinds of question about behaviour. These are *how* behaviour was performed and *why* behaviour was performed. For each of these questions a different level of explanation may be appropriate.

The 'why shake hands?' question could be answered at a social level (social psychological in most cases, but sociological in the case of, for example, Gerry Adams and David Trimble) or it could also be answered in evolutionary terms.

The 'how shake hands?' question can't be answered at a social level and a lower level of explanation is necessary. This may be the cognitive psychological level, which would try to explain the mental processes guiding the motor movements that control the hand. Alternatively, it may be at a physiological level, which explains how nerve fibres carry signals to muscles, how the muscles contract and so on.

There are advantages to reductionism conceived in this way. It fits in with attempts to be scientific, it provides nice concise explanations and in some cases (as with dopamine and schizophrenia) it suggests successful interventions. For some questions, we must look for answers at a lower level. However, there are also a number of disadvantages – in particular, the fact that reductionism tends to lose many of the important features of the phenomenon of interest – the idiom 'can't see the wood for the trees' applies here, since reductionism is really about looking for the trees.

TABLE 5.1 A HIERARCHY OF SCIENCES

Science	Units of explanations
Sociology	Society
Social psychology	Groups
Cognitive psychology	Mental processes
Physiology of systems	Brain physiology
Physiology of units	Genes
Anatomy/biochemistry	Chemicals in the brain
Chemistry	Chemicals in isolation
Physics	Subatomic particles within chemicals

As an example of the difficulties inherent in some reductionist approaches, consider the search for neurogenetic explanations of violence. It has been suggested that there is a 'gene for violence' or that violent people have an excess of testosterone. These seem to be easily understood explanations of violence, but they overlook the fact that violence tends to happen in particular social and cultural contexts. The notion of 'violence' itself is constructed by social agreement. A terrorist who bombs a building would be seen as 'violent', and as requiring explanation. However, a pilot who bombs an enemy building would be seen as serving his/her country and not needing explanation.

The difference here is one of social interpretation and biological processes won't necessarily correspond with social categorisations. Fortunately, in much of psychology the phenomena being investigated are more clearly defined and direct correlates between psychological and physiological phenomena can be found. For example, we can usefully identify how memories are physically stored in the brain and we can identify the genes that give people a predisposition for certain illnesses.

One concern about reductionism is that in some cases reductionist explanations have been sought for particular reasons or purposes. Reductionist arguments have been used, for example, to claim that there are racial differences between groups and to argue for the inevitability of inequality in society. This isn't a problem of reductionism in itself, but rather an example of bias in psychology. These concerns are addressed in Chapter 4.

Self-test:

- What are 'levels of explanation'?
- What two kinds of question does psychology ask about behaviour?
- What are the advantages of reductionism to psychology?
- What problems arise with reductionist approaches?

Free will and determinism

Discussing reductionism in the context of neurogenetic explanations brings us to the next issue that concerns psychologists. This is the question of whether we have free will, or whether we should accept determinism – the view that all behaviour is determined. Neurogenetic explanations are deterministic, in that they assume that behaviour is caused (or determined) by particular brain structures or particular chemical balances or a particular genetic makeup. Thus, if you have a gene to be violent, you will be violent. Your behaviour is determined by the gene. Reductionism in Rose's (1998) sense is deterministic, since it suggests that a given phenomenon can be explained by (because it is determined by) processes at a lower level.

The debate over whether we have free will or whether behaviour is determined is an ancient one in philosophy and given psychology's antecedents has inevitably become a debate within psychology, too. However, unlike the reductionism issue, the debate over determinism is often obscured, because many psychologists implicitly adhere to the view that behaviour is determined. This is an inevitable consequence of psychology's determination to be scientific

ACTIVITY BOX 5.1

Reductionism

In this chapter, we use the example of explaining a handshake to show that we can explain a given thing at different levels of explanation. We saw that a handshake can be explained in terms of sociology, of social psychology, of cognitive psychology and so on. Try doing this yourself. Draw up a table showing the levels of the hierarchy, like the one here, leaving a blank column in which to enter your explanations. Now work down the hierarchy trying to explain how to tell a joke at each level.

You'll probably find that the kinds of explanation you come up with change as you go down the table, from explanations of *why* people tell jokes to explanations of *how* people tell jokes. Look back at what you've written and mark whether each explanation is an explanation of 'why' or an explanation of 'how'. Now try giving the other kind of explanation for each level. For example, at the social psychology level you might have explained that people tell jokes to build up friendships or to break the ice in an awkward situation. These are 'why' explanations. Alternatively, you might give a 'how' explanation in terms of the way people take turns to tell jokes, the way in which jokes rely on shared knowledge of how the world works and so on.

Level	Explanation
Sociology	
Social psychology	
Cognitive psychology	
Physiology of systems	
Physiology of units	
Anatomy/biochemistry	
Chemistry	
Physics	

(Valentine, 1992). Scientific psychology involves looking for cause-and-effect relationships (see Chapter 3), which, of course, means that behaviour must be caused. Any scientific approach to psychology is therefore a deterministic approach at heart.

There would seem not to be much of a debate over determinism. Unfortunately, this deterministic view conflicts with our subjective experience of having free will. If asked, most people would say that their behaviour is often the result of conscious choices or is in some other way undetermined. Much of the time, therefore, psychology keeps quiet on the issue. The main exceptions are in the areas of neurogenetic determinism, where the determinism is made explicit, and humanistic psychology, where free will is championed.

In terms of 'mainstream' psychology, the most prominent exponents of determinism were the behaviourists, who believed that behaviour was determined by learnt responses and the psychodynamicists, who believed that behaviour was determined by a combination of biology and early experience. The important point is that most researchers in psychology continue to use a behaviourist methodology and so continue to work on the implicit assumption that behaviour is determined.

To consider the debate between free will and determinism in more depth, let's look at some definitions of the concepts.

Free will

One of the problems psychologists face is what precisely is meant by free will. Valentine (1992) suggests a number of possible interpretations of what we mean when we say that we have free will.

Choice

In everyday terms, people would say they have free will if they have a genuine choice in a particular situation. However, we can't test this assertion because we can't guarantee that there isn't some underlying cause that we aren't able to identify, perhaps because of a lack of knowledge or a lack of necessary technology.

Behaviour that is uncaused

This doesn't really mean behaviour that is random, which is what a literal interpretation would suggest. Experience suggests that behaviour is predictable in some way. This interpretation is better phrased as meaning behaviour that is unconstrained (Gross, 2003). This interpretation is adopted by soft determinism, which we shall consider later.

Voluntary behaviour

Voluntary behaviour is behaviour over which we have control, as opposed to involuntary behaviour, which is behaviour that is an uncontrolled reflex. If we have control, then this suggests that we have free will. We can give a more technical definition of 'choice' if we say that choice means exerting control over our behaviour.

None of these explanations is particularly problematic and all of them seem to express our subjective experience of feeling free. None of them denies that behaviour is predictable and in some versions of determinism they all fit in with a deterministic view. The advantage of adopting these interpretations is that they fit in with subjective experience. However, they may not fit in with a scientific model. Accepting free will also has the advantage that we can continue to accept our everyday ideas of moral responsibility. Rejecting the idea that people are responsible for their actions, as extreme determinism would suggest, would make responsible social behaviour difficult. The main disadvantage of accepting a strong free will position is that you're then left with the rather difficult task of finding an alternative explanation of how behaviour comes about.

Self-test: How can we define 'free will'?

Determinism

Determinism comes in a number of forms, depending on what forces are claimed to determine behaviour. The two extremes are behaviourism, which says that all behaviour is determined by experience, and neurogenetic determinism, which says that all behaviour is explained by evolution and genetics. The contrast between these two positions is at the heart of the heredity/environment debate that is covered in the next section. When we consider that debate, we'll see that the debate is about *what* determines behaviour, not *whether* behaviour is determined.

The common argument in the different flavours of determinism is that all behaviour has a cause. Taken to an extreme, determinism suggests that all future behaviour is predictable, given sufficient information. This has the advantage of fitting scientific explanation and can allow a degree of control. However, if all behaviour is determined, then how can we ascribe praise or blame to actions? Other disadvantages of determinism are that modern physics suggests that physical events are not entirely determined, so how can we say that behaviour is, and that it is unfalsifiable (Valentine, 1992).

An intermediate position is that of soft determinism, which holds that behaviour is determined to a certain extent, but that in the absence of compulsion people have an element of choice over courses of action. In soft determinism, the focus is on coercion rather than causation. It assumes that there is ultimately a causal explanation, but that the explanation is difficult or impossible to access. The ultimate cause is, therefore, irrelevant to explaining everyday behaviour.

This view seems to fit subjective experience. The question then changes. Soft determinism is basically saying that many things are determined, but that there is some degree of free will. So the question becomes one of how much is determined and what is free will. Most debate in psychology, and most differences between theories, is in terms of this. For example, neurogenetic determinism argues for a large degree of determinism, whereas much modern social psychology argues for a large degree of free will. As a rule of thumb, reductionist theories tend to be deterministic, whereas non-reductionist theories tend to allow more free will.

In considering the debate between free will and determinism, it's important to recognise that there may not be a single answer to the debate for all of psychology. Psychologists study many different phenomena and it's possible that phenomena differ in the extent to which they are determined. One contribution to the development of cognitive psychology came from Chomsky (1957) who argued forcefully that language production is a spontaneous and creative process. We choose what we're going to say, even though there will be a number of factors affecting what it is that we say.

By way of contrast, it's clear that some phenomena are strongly determined. For example, many human behaviours are instinctive responses that we have limited control over (try not blinking when someone throws something at your eyes) and there are clearly identified genes for a range of conditions, including *Down's syndrome* and *phenylketunoria* (*PKU*). It's also important to recognise that determinism seems to work for psychology and for the sciences in general (Valentine, 1992).

We will see throughout the book examples of well-founded and well-supported theories that identify determining causes for behaviour. It seems rather unreasonable to adopt a strong free will position given the volume of psychological knowledge that suggests that most behaviours are, to some extent, determined.

Self-test:

- What is the common argument underlying determinist viewpoints?
- What does the term 'neurogenetic determinism' mean?
- What is 'soft determinism'?
- Why is the notion of determinism important for the scientific method?

Heredity and environment

The question of the relative influences of heredity and environment on behaviour is one of the most visible and long-running debates in psychology. Many of psychology's most controversial claims rely on the view that heredity is a strong determinant of human nature. This debate is where the influence of psychologists' beliefs on their theorising is most apparent, demonstrated in many discussions of the issue (e.g. Gould, 1997; Rose et al., 1990). The issue is sometimes known as the *nature–nurture debate* and concerns whether genetic inheritance (the heredity or nature side) or the environment (the nurture side) determines behaviour. Today, the debate is couched in terms of genetics, but it actually predates the discovery of genes (Gould, 1997). In psychology, the debate is mainly concentrated on the explanation of personality and intelligence.

The opposing views

The environmental outlook suggests that a newborn child is a blank slate, whose nature will be shaped by experience. This allows the possibility of change – if you change the environment then you change the person. Environmental explanations provide a basis for attempts (such as those of the behaviourists) to control and modify behaviour.

Hereditarian explanations provided the basis for the *eugenics* movement and are also the basis of some of the theories discussed in Chapter 4. The hereditarian position claims that newborn children carry a blueprint that dictates aspects of their character. Behaviours develop over time, where maturation leads to genetically determined behaviours becoming part of a person's repertoire.

Questions of heredity and environment

Early discussions of the heredity–environment debate asked which factor determined behaviour. However, it became clear that both heredity and environment have an effect on the individual (see Focus point 5.1). The question then

FOCUS POINT 5.1

Relationship between genes and environment

The hereditarian view is usually taken as denying the possibility of change. If behaviour is innate, then it is fixed. However even in physical makeup, where there is clearly a strong genetic element, we can see a clear environmental effect. Take height, for example. Tall parents will generally have tall children and short parents short children. That is in the nature of genes. There are three observations here however (Lewontin, 2001):

- The actual height of the child is impossible to predict, because the operation of genes is shaped by chance factors.
- Environmental effects can disturb the trend. For example, poor nutrition will inhibit growth.
- The average height of people has increased over time, as a result of improved environmental factors, particularly nutrition.

Even in an area as clearly genetically determined as height, there is a strong environmental effect. A complete explanation of the role of heredity and environment therefore has to account for both.

changed to how much each factor determined behaviour. This was based on the assumption that heredity and environment had separate effects, which could be added together to explain the totality of behaviour.

For many psychological phenomena, it seems entirely reasonable to suggest that there's both a genetic and an environmental component. However, as the example of height shows, there's an interaction between the two. Two identical twins raised in different environments will differ. Despite the occasional story about twins separated at birth who meet up 50 years later and find they both have purple as their favourite colour, most identical twins are different from one another, reflecting differences in their environment.

The opposite side of the coin is that the same environment acting on two genetically different individuals will have a different effect, depending on the makeup of the individual. The reason for this is that genes are expressed through an environment. The question then becomes: 'In what way do genes interact?' This is likely to differ for different phenomena and there is considerable debate over how the interaction happens in particular aspects of human psychology.

Interaction between heredity and environment

In trying to explain the nature of the interaction between heredity and the environment, we're trying to explain how individuals get from an initial 'blueprint' encoded in the genes to their adult form. The blueprint, which is a set of genes encoded in the body's chromosomes, is called the *genotype*. The individual's structure and characteristics are known as the *phenotype*. The question we're asking then is what happens to get from the genotype to the phenotype.

The genotype actually contains more genes than we need. Some will only activate under certain conditions and some are recessive, which means that they are suppressed in the presence of a dominant gene for the same characteristic. Less than 50% of the genotype contributes to the phenotype, although all remain in the chromosomes to be passed on to offspring (Stratton and Hayes, 1999). This apparent wastefulness actually introduces a lot of flexibility into development, but it does mean that the final phenotype cannot easily be predicted from the genotype.

Self-test: To what do the terms 'genotype' and 'phenotype' refer?

The environment

The environment exerts a significant influence on how a genotype is realised as a phenotype. The term 'environment' covers a broad range of factors. It includes conditions within the womb and both the physical and social environments throughout life. Environmental factors may be organic or stimulative and in each case a factor may have a broad or narrow effect.

Organic factors

Organic factors are those that lead to physiological changes. For example, disease and substance abuse will have a negative effect on development, while good nutrition will have a positive effect. Broad organic factors are those that leave permanent changes, such as brain damage, while narrow organic factors are those with a short duration, such as measles.

Stimulative factors

Stimulative factors make up the social context in which the individual develops, ranging from the narrow effects of the kind of school attended to the broad effects of social class and life opportunities.

Self-test: What are organic factors in the environment?

The genotype

Characteristics represented in the genotype vary along a continuum of how direct an effect they have on the phenotype. Some characteristics are very direct and are resistant to change (for example, Down's syndrome). Others may lead to a susceptibility that will be realised under certain environmental conditions, as may be the case with schizophrenia. Still others may be very indirect and social stereotypes will exert a greater effect, which may explain

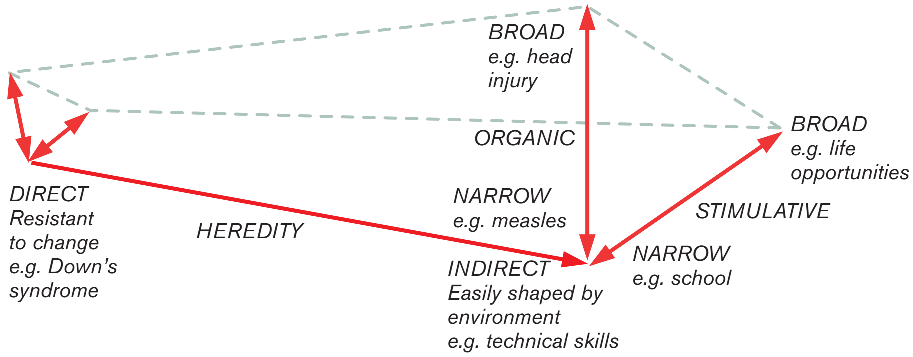

Figure 5.1 Heredity–environment interaction (the more indirect the effect of heredity on a characteristic, the greater the effect of organic and stimulative environmental factors)

ACTIVITY BOX 5.2

Popularity of biological explanations

Have a look around for TV documentaries and popular science books on topics in psychology. Where do you think the presenters and authors are coming from in terms of the debates covered in this chapter? In particular, do you think they put across a 'nature' argument more than a 'nurture' argument? Why do you think they do this? What effects do you think this might have on people's everyday understanding of psychology?

If you do find these types of topic covered, you'll discover that popular television programmes, books and magazines tend to put across only the nature side of the argument. Think about the number of books that suggest that men and women behave in different ways because they have evolved differently. Barker (2003) suggests a number of reasons why biological explanations may be so prevalent in 'popular' psychology. These include:

- Purely biological explanations are simpler and more easily understood than considering complex interactions between heredity and environment.
- Biological explanations let society off the hook for causing inequalities.
- Biological explanations support pre-existing beliefs about differences between groups.

In addition, biological explanations may appear to be more scientific, and thus more respectable, than psychological explanations.

gender differences in technical skills. Where genotype characteristics have a very indirect effect, the environment plays a larger role in influencing the development of the phenotype.

It has been estimated that there are over 70 trillion possible human genotypes (Malim and Birch, 1998). The number of possible environments is potentially infinite. Clearly, then, there are many potential phenotypes, which accounts for the human diversity we see all around us. Figure 5.1 illustrates how genotype directness, organic environmental effects and stimulative environmental effects interact.

Self-test: What is the difference between 'direct' and 'indirect' characteristics represented on the genotype?

Genotypes and psychology

The interaction between heredity and environment described earlier is certainly true for the physical characteristics of individuals. However, the picture is a little more complicated for psychological characteristics. This is partly because psychological characteristics have no tangible reality. We saw in Chapter 3 that it is difficult to be certain that the psychological characteristics we identify really exist. When we are sure they do exist, it can be difficult to correlate characteristics with our genetic makeup. The reason for this is that there is an intermediate step between the genotype and the phenotype for psychological characteristics. This intermediate step is the brain (Lewontin, 2001).

It is safe to assume that psychological characteristics result from the operation of the brain. If there is a genetic basis for psychological characteristics, it must be because genes specify a certain brain organisation that underlies the characteristic. However, unlike other parts of the body the brain has the properties of self-organisation and plasticity. Over the course of development, the brain develops new connections between the nerve cells that make it up, in response to experience and learning. In addition, the brain prunes itself by allowing those cells that are deemed unnecessary to die. This process starts in the womb and continues throughout childhood. The result is that the adult brain has half the number of brain cells of the newborn child's brain (Kolb and Whishaw, 2003).

If the genotype sets a blueprint for the brain, then the adult phenotype will necessarily be different from the original blueprint in some ways. The degree of difference will vary for different parts of the brain. Thus the brain stem will differ considerably less than the association cortex in the cerebellum. We can expect also, then, that the degree of difference will vary for different psychological characteristics. However, we need to know more about how different characteristics are represented in brain structures and how these brain structures develop before we can come to firm conclusions about the genetic basis of psychological characteristics.

Self-test:

- To what extent can we separate the effects of heredity and environment?
- How does the brain mediate between the genotype and the phenotype for psychological characteristics?

CLASS ACTIVITY BOX 5.1

Debating issues in psychology

In this chapter, we've seen a number of issues and debates in psychology. A good way to help with understanding these debates is to actively engage in them. For this activity, therefore, you'll debate resolutions relating to the topics covered in the chapter.

In engaging in a debate, you should split your group into two debating teams. One team will speak in support of a resolution, while the other will speak in opposition to it. Some suggested resolutions are given later, but you can make up others if you wish. Just make sure that the resolution states an opinion about which there can be genuine disagreement. Remember that you're debating in support of the team's position, not your own personal opinion. You may agree with the resolution but find yourself in a team that's arguing against it: make sure you stay with the resolution and keep your own opinions out of the way.

When your team presents its case, you need to give *strong reasons* for your view. A strong reason is one that supports your opinion, that is convincing and that is clear and specific. Each reason should be supported with evidence, either from academic authorities or from research studies. Avoid relying on anecdotal evidence or common sense. A strong reason with supporting evidence constitutes an *argument* within the debate.

The debate should be structured so that members of each team take turns to state arguments, starting with the team speaking in support of the resolution. After all the arguments have been presented, take 5 or 10 minutes to prepare a *rebuttal* of the other team's arguments. The rebuttal should seek to disprove the arguments the opposing team has made. It should also include a summary of your own team's position. The team speaking against the resolution should give their rebuttal speech first, with the team speaking for the resolution speaking second.

There needs to be a judging mechanism to decide which team has won the debate. This might be a show of hands from the audience or the decision of the seminar leader. Whichever judging mechanism is used, the judgement should be based on the clarity and strength of the arguments presented and the extent to which they're supported by evidence. The winning team will be the one that has made the best arguments, not necessarily the one that is 'right'.

Some possible resolutions to debate include:

- Psychological characteristics are strongly genetically determined.
- People have free will.
- Reductionist explanations are appropriate for psychology.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe and evaluate different forms of reductionism.
2. Assess how reductionism relates to the explanation of phenomena at different levels of explanation.
3. Compare and contrast free will and determinism and evaluate the importance of determinism for the scientific method.
4. Evaluate the hereditarian and environmentalist sides of the nature–nurture debate.
5. Explain how heredity and environment interact in shaping human behaviour.

Further reading

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Essay titles and references

1 How valid are genetic explanations in psychology? Critically discuss the validity of genetic explanations, highlighting arguments for and against an evolutionary approach to psychology.

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2 How useful are reductionist explanations in psychology? Critically discuss with regard to the strengths and weaknesses of the various forms of reductionism. Do reductionist approaches give us valid explanations of psychological phenomena?

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3 Do we have free will or is all of our behaviour determined? Critically discuss with reference to the concepts of free will and determinism and to what psychological theories and approaches claim about human behaviour.

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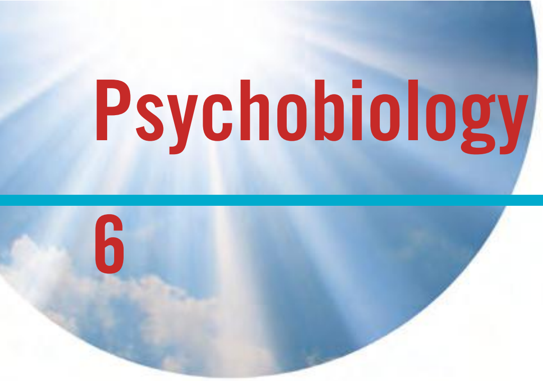
section two

Chris Chandler

Psychobiology

6 Introduction to psychobiology and genetics 54
7 The brain, neurons and nervous systems 71
8 Animal learning and cognition 100
9 Motivation, brain reward mechanisms and behaviour 115
10 Emotion and sleep 125
11 Perceptual systems and motor control 136



Psychobiology

6

Introduction to psychobiology and genetics

Route map

This chapter consists of three broad sections. The first is an introduction to the psychobiological perspective and its diversity. The second examines the scientific nature of animal experiments and the use of animals in research within the UK. The third section focuses on evolution and genetics. The process of evolution suggested by Darwin explained how the process of natural selection influences subsequent generations; Mendelian genetics helped clarify how this process occurs and modern molecular biology has narrowed the focus to individual genes on chromosomes.

Introduction

Psychobiology is a subdiscipline of psychology that seeks to explain behaviour in terms of biological mechanisms. Psychobiology is also known as biopsychology, biological psychology and behavioural neuroscience. Many general textbooks have a section on (or even called) the 'biological bases of behaviour'. This title is somewhat misleading. It implies that the biological influences on behaviour are a one-way street: that biology affects behaviour. In fact, an organism's behaviour and its environment can in turn influence its biology. The use of the term 'environment' here refers to everything outside the organism. As we will see, the process of evolution demonstrates an environmental influence over a long period of time. In this section on psychobiology we will examine how both biology and the environment interact to produce and influence behaviour.

Reductionism

All psychobiological accounts of behaviour use reductionism. Reductionism permits us to explain behaviour at the biological level. Within biology there are also different levels of investigation (see Figure 6.1). Investigation can start with large regions of the brain (e.g. the temporal lobes and memory (Milner, 1970)) and then move to smaller identifiable groups of nerves (e.g. the hippocampus and memory (Zola-Morgan and Squire, 1986)). Reductionism also helps answer important questions. For example: 'What does the brain do?' Perhaps one response is that the brain does everything, but this is not a satisfactory answer. By reducing the big questions to smaller elements we can ask more specific questions, such as: 'What does the hippocampus do?' This is a much more manageable question, which means that we can give a more precise answer.

In the past 50 years there has been a rapid increase in our understanding of behaviour at the genetic level. Psychologists have embraced genetic research methods and techniques as crucial tools to aiding our understanding of behaviour (Plomin, 2002; Plomin et al., 1997). Behavioural analysis can now take place at the molecular level – the question now is: 'What genes are responsible for our behaviour?'

Self-test: What is reductionism?

Psychobiology: a multidisciplinary account of behaviour

Psychobiologists use a wide range of information from other subjects to explain behaviour. As the quote in Focus point 6.1 suggests, psychobiology is truly multidisciplinary. Some of the key areas that contribute to it are indicated in Figure 6.2. In this figure, the disciplines that contribute to psychobiology can be seen together with the subdisciplines of psychobiology. These subdisciplines can feed back to other disciplines. Psychobiology, then, is the meeting place of many different schools of thought and diverse scientific research, all of which are used to provide an account of behaviour.

It is important to be aware of the dynamic, ever changing nature of psychobiology. There is an almost daily increase in knowledge from all the contributory disciplines. With

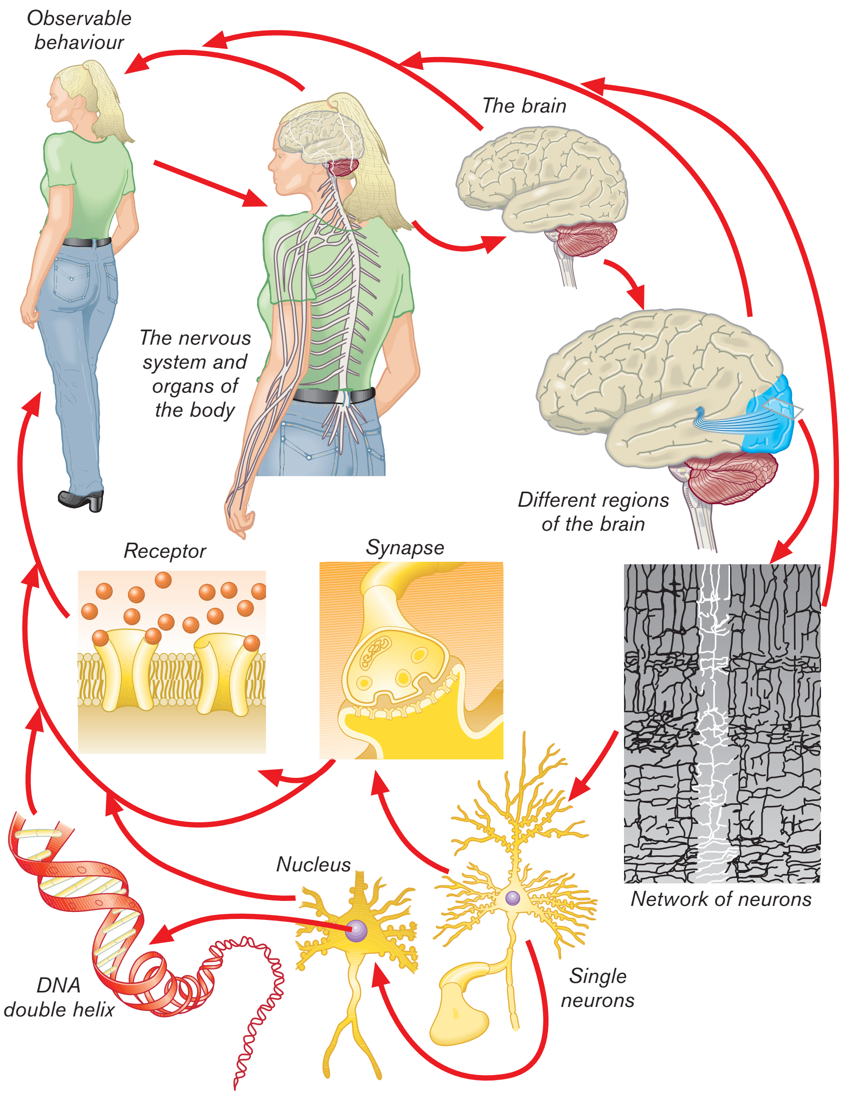

Observable behaviour
The brain
The nervous system and organs of the body
Different regions of the brain
Receptor
Synapse
Network of neurons
Nucleus
DNA double helix
Single neurons

Figure 6.1 Levels of analysis within psychobiology: we can study behaviour at different levels – from large parts of the brain down to the effects of genetics

new information we have to be prepared to adapt and change any previously accepted ideas regarding the biological mechanisms underlying behaviour. We have to be able to account for behaviour within new theoretical contexts and test these theories rigorously via experimentation.

Technological advances, in particular, have permitted a substantial amount of new research to take place within psychobiology. An example of this is the use of functional magnetic resonance imaging (fMRI) and positron emission tomography (PET), a sophisticated X-ray technique that examines the processes of the brain in action (see Research methods box 6.1).

FOCUS POINT 6.1

Sahgal on psychobiology

Sahgal (1993) said that 'Behavioural neuroscience (psychobiology) is the study of the neural basis of behaviour, but this colourless definition does not do justice to the wealth of scientific expertise that it incorporates.'

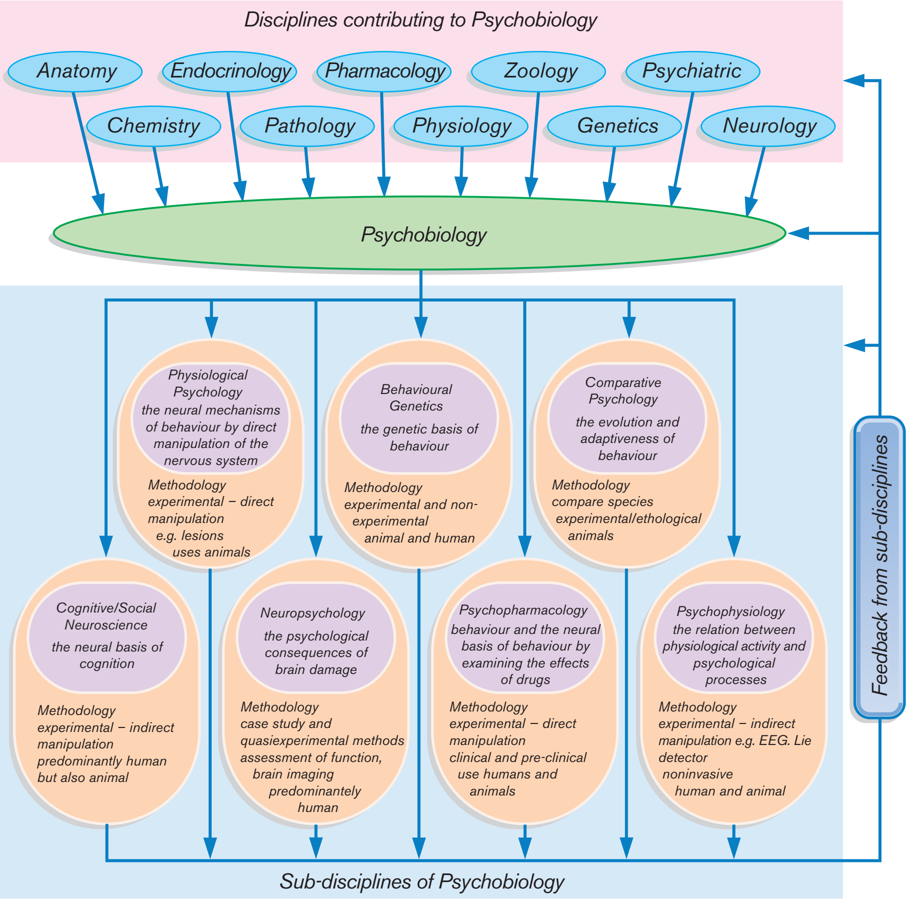

Disciplines contributing to Psychobiology
Anatomy
Endocrinology
Pharmacology
Zoology
Psychiatric
Chemistry
Pathology
Physiology
Genetics
Neurology
Psychobiology
Physiological Psychology
the neural mechanisms of behaviour by direct manipulation of the nervous system
Methodology
experimental – direct manipulation
e.g. lesions
uses animals
Behavioural Genetics
the genetic basis of behaviour
Methodology
experimental and non-experimental
animal and human
Comparative Psychology
the evolution and adaptiveness of behaviour
Methodology
compare species
experimental/ethological
animals
Cognitive/Social Neuroscience
the neural basis of cognition
Methodology
experimental – indirect manipulation
predominantly human but also animal
Neuropsychology
the psychological consequences of brain damage
Methodology
case study and quasiexperimental methods
assessment of function, brain imaging
predominantely human
Psychopharmacology
behaviour and the neural basis of behaviour by examining the effects of drugs
Methodology
experimental – direct manipulation
clinical and pre-clinical
use humans and animals
Psychophysiology
the relation between physiological activity and psychological processes
Methodology
experimental – indirect manipulation e.g. EEG. Lie detector
noninvasive
human and animal
Feedback from sub-disciplines
Sub-disciplines of Psychobiology

Figure 6.2 The disciplines that contribute to psychobiology, and the subdisciplines of psychobiology

RESEARCH METHODS BOX 6.1

Inside-the-headoscope

Vic Reeves in his *Big Night Out* TV programme once tried to see what was going on inside the brain of his assistant Les. He used what he referred to as an inside-the-headoscope. Whilst the show used this idea to good effect, scientists also seek to investigate the brain.

There are a number of methods that allow this, but two are prominent: functional magnetic resonance imaging (fMRI) and positron emission tomography (PET).

PET uses compounds that can be tagged with radioactivity. The PET scanner can detect this radioactivity. Depending on what you tag with radioactivity you can see which parts of the brain are being used during certain tasks or where certain receptors are in the brain.

Functional MRI measures the changes in oxygen flow in the blood. Depending on which part of the brain is being used, oxygen levels will be increased in busy areas.

Similarly, other areas of psychology also benefit from psychobiological investigation. Developmental psychology is able to chart changes in cognitive ability from birth to old age (see Chapter 18). Underlying these changes are biological substrates that change over the lifespan of the individual. The growth and death of cells are keenly investigated.

If understanding behaviour is like fitting together a jigsaw, then the many disciplines related to psychobiology represent the different pieces. Together they can start to complete the picture, but there are still some elusive pieces yet to find.

Subdivisions of psychobiology

Figure 6.2 illustrates the broad subdisciplines that make up psychobiology and the different methods they use to address questions. In Applications box 6.1 you can see how one subdivision, psychophysiology, is applied. These areas are strongly represented in the British Psychological Society's view of important areas within psychobiology. However, the subdivisions are expanding and now include what some people may think as two disciplines that are diametrically opposed in their psychological explanation:

psychobiology and social psychology. Despite both areas seeking to explain behaviour, they do so from a different theoretical standpoint, but now they are joining together to form social neuroscience. Social neuroscience seeks to explain the neural mechanisms underlying social cognition (see Blakemore and Frith, 2004; Blakemore et al., 2004; Todorov et al., 2006).

APPLICATIONS BOX 6.1

Psychophysiology

It is easy to see that psychobiology has direct and relevant applications to medicine. However, there is one branch of psychobiology that is used to detect lies. Psychophysiology has the key to assessing the truth.

The polygraph, or lie detector, measures the body's response to stress. It does this by monitoring such things as heart rate, blood pressure level and sweat production. Think about what happens when you are under stress: your heart rate and blood pressure may increase and you may start to sweat more. When you are telling lies you are under stress. These are also the telltale signs that you are not telling the truth. Many films have shown polygraphs in use and many daytime television programmes use psychophysiology in the quest to find out, say, if one partner in a relationship is cheating on the other.

Figure 6.2 also shows that psychologists do not rely entirely on evidence from humans. Psychology (like the other contributory disciplines) owes a great debt to the study of animals. Studies of animals and their behaviour have been instrumental in shaping theories and advancing our understanding of the biological mechanisms that underlie human behaviour.

Self-test: Describe the main disciplines contributing to psychobiology and the subdisciplines of psychobiology.

Animal and human research

Research is vital to increasing our understanding of behaviour. Only by experimental investigation can we begin to unlock the mysteries of the brain. It is clear that if you wish to understand human behaviour then you need to investigate humans. Indeed, many experiments are conducted each year that use humans to investigate the relationship between biology and behaviour. These experiments are published only if they fulfil all the requirements of an ethically acceptable procedure. A full account of the ethical guidelines is provided by the British Psychological Society (BPS) for experimental conduct (see Chapter 37 for a summary). However, the BPS's jurisdiction only extends to its members and there may be different standards outside the UK.

Research using human participants can answer only some questions. Other questions remain because of the ethical and moral restrictions placed on human research. This is when animal studies are useful in trying to resolve questions that could not otherwise be answered.

We are nowadays very aware of moral and ethical issues due to the advancement of genetic engineering, its potential use and misuse and the high-profile media debate surrounding it. The concept of a utopian human race and cloned humans remains ethically unacceptable to most people, but we should not become complacent in our position of superiority. There are numerous instances of inhumanity in the name of science. For example, only just over 50 years ago in Nazi Germany evolutionary theory was used as the justification for eugenics (Brune, 2001) and to further scientific knowledge (Shevell and Peiffer, 2001).

Ultimately we, as humans, are animals. We are highly sophisticated and socialised animals, but we are still animals. Humans as a species have evolved but still share many similarities with other species. This shared heritage is the area in which evolutionary and comparative psychologists work. The society we live in permits a large number of scientific procedures to be conducted on animals that would be regarded as unethical in humans. Scientists can lesion (destroy) part of a rat's brain but cannot do the same to a human for the advancement of knowledge. The rat is the most researched animal on the planet. However, rats are not the only animals used by scientists. Many species have been used, ranging from snails to mice and pigeons to chimpanzees. Which animal is used depends on the question asked and whether the animal is in a position to provide an answer.

Animal research is an area charged with moral, ethical and emotional debate and we will not go too far into it here. If you wish to investigate the arguments surrounding vivisection, then the British Union for the Abolition of Vivisection (BUAV) and Research Defence Society (RDS) provide coherent contrasting accounts.

The antivivisection movement (of which some scientists are members) has two main objections to experiments with animals. First, it considers it unethical to experiment with animals. The basis of this view is that such procedures are cruel to the animal, inducing unnecessary suffering to an animal that has no choice. Second, the scientific validity of experimentation is called into question: how can an animal provide us with insights into human behaviour? Those that support the use of animals have challenged this view with statements of the advantages, to animal and man, of experimentation with animals. All groups would agree that unnecessary suffering should never occur. Perhaps the biggest point of contention is the definition of what *is* necessary. However, legislators past and present consider animal experimentation necessary to answer some questions.

This section explores how animals can best be used to explain the biology of behaviour and the extrapolation of animal research to humans. However, we must start by placing animal experimentation within the context of the United Kingdom.

In the United Kingdom, the government (via the Home Office) is responsible for ensuring that animal welfare is maintained during experiments. The Home Office also decides if the experiments are really necessary. Its aim is to refine, reduce and replace animal experimentation (the '3 Rs'). This is a goal that remains to be achieved. Under the Scientific Procedures Act 1986 scientists are only allowed to perform certain experiments if they are suitably trained. They also have to provide a good reason for doing the experiments, explaining why they are needed and can only carry them out in particular laboratories.

Thus three licences are needed from the Home Office:

1. One licence is required for the establishment where the experiment is conducted, ensuring a high quality of care and a suitable environment for the animal.
2. A second licence is required for the project (or set of experiments). This permits only certain procedures to be carried out on the animal. A scientist may not just do anything he or she wants.
3. The third licence is a personal licence for a particular individual to conduct the experiment. This is granted only if the applicant has received appropriate training and demonstrated sufficient competence in animal welfare.

The Home Office sends out inspectors and veterinarians, without prior notice, to visit establishments to check that the rules are being maintained. Heavy fines and a custodial sentence may result from successful prosecution of those failing to adhere to the rules governing animal experiments.

Validity of animal models of behaviour

The Home Office deals with the welfare and legal aspects of animal research. However, the scientist has to do more than simply comply with legislation. He or she needs to be clear that the questions asked of an animal in an experiment can actually be answered. Animals are used in many ways within psychobiology and cognate disciplines, but these fall into three key domains (Willner, 1984, 1986, 1991; Willner and Mitchell, 2002):

1. The first is the screening test, to find out if a procedure or drug is going to be useful. These are favoured early on in drug development by drug companies.
2. The second is behavioural bioassay, which aims to mimic or model a physiological mechanism in the whole animal. Willner (1991) points out that there are good reasons for looking at the behavioural consequences of a physiological event. Behaviour is the result of the integration of many brain mechanisms. Unlike pure physiology we can see how the whole system works to influence behaviour.
3. The third domain, and the one most important to the psychobiologist, is the animal model or *simulation* of behaviour. More often than not, these are simulations of abnormal behaviour. As we can see in Focus point 6.2, Willner claims there is a necessity to use animals wisely. To put it another way, are we getting suitable answers to the questions we ask?

FOCUS POINT 6.2

Willner's view

Willner (1991) stated that 'models are tools. As such, they have no intrinsic value; the value of a tool derives entirely from the work one can do with it. Conclusions arising from the use of a simulation of abnormal behaviour are essentially hypotheses that must eventually be tested against the clinical state. An assessment of the validity of a simulation gives no more than an indication of the degree of confidence that we can place in the hypothesis arising from its use.'

Using the concepts behind the development of psychometric testing and questionnaire design (see Chapter 31), Willner (1984) proposed that animal models should be validated. He developed the appraisal of an animal model for psychopharmacology, but it can be extended to other aspects of psychobiology. Three sets of validity are differentiated: predictive validity, face validity and construct validity (see Activity box 6.1). When assessing the utilisation of animals these criteria provide a useful structure:

- Predictive validity This is similar to a screening test, but goes beyond it. If you wish to have an animal model of schizophrenia then the many types of antipsychotic medication should also work in the model (see Chapter 7). Furthermore, you should be able to exacerbate the symptoms in the animal in the same way you can in the human. Experiments in which patients with schizophrenia have been given amphetamine have shown some deterioration in their symptoms (van Kammen et al., 1982). Similarly, if you give a rat amphetamine its behaviour becomes disorganised (e.g. Ellinwood and Escalante, (1977)).
- Face validity This is the degree to which there is a similarity between the model and the behaviour to be modelled. Are the symptoms of schizophrenia modelled in the animal? Are the symptoms that are modelled in the animal significant in schizophrenia and schizophrenia alone? If the answer is no, then you may have problems with the animal model because you cannot be sure it is modelling schizophrenia.

ACTIVITY BOX 6.1

Animal models

The face validity of an animal model, may at first seem an easy thing to achieve, after all you just have to map behaviour onto symptoms.

To see how easy this is choose some archetypal psychological/psychiatric/neuro- logical disorders and see how the symptoms could be expressed in the animal.

Some good ones to start with are schizophrenia, Parkinson's disease and ADHD. Then try drug addiction, depression, Alzheimer's disease and phobias.

Questions you need to address are:

1. **What are the symptoms?** In schizophrenia the obvious symptoms are hallucinations and delusions, but there are many more.
2. **What are the problems regarding the symptoms?** Are they agreed on? Are hallucinations and delusions necessary for a diagnosis of schizophrenia? Not all psychiatrists agree what the symptoms are. Diagnosis is a matter of interpretation as there are no biological measures of schizophrenia.
3. **Can an animal display the symptoms?** Can a rat or any other animal have a hallucination? Can rats be deluded?
4. **Can we measure the symptoms** (e.g. hallucinations)? If it can have a hallucination, how do you know? After all it can't tell you!

If the behaviours cannot be easily seen to have face validity, then do they have construct validity?

Additionally, you will have to account for new research findings in the model. Thus a model of behaviour may have face validity one day, but not the next, after new knowledge is assimilated.

- Construct validity A limitation with face validity is that the different species of animals have different overt behaviour. Willner (1991) uses the example of maternal behaviour to demonstrate this point. Maternal behaviour is evident across all species. However, it is expressed differently. The rat keeps her litter close and retrieves strays with her mouth. The rat mother does not change nappies, warm milk or go to rat playgroups, while the human mother, in general, performs some, if not all, of these behaviours.

The observable behaviours are different. However, they are regarded as homologous – arising from the same physiological substrate. This is the theoretical rationale behind the behaviour. If experimentation supports the theory then the model has a degree of construct validity. It has been argued that some models of schizophrenia score more highly than others for construct validity (Ellenbroek and Cools, 1990). Construct validity is harder to achieve for the animal models of addiction because the theories behind drug misuse do not have a single theoretical rationale: some scientists argue that drug addiction is due to the pleasant actions of a drug, while others claim it is motivated by the urge to avoid unpleasant withdrawal symptoms (see Goudie, 1991; see also Chapter 9).

Self-test: How would you evaluate an animal model in psychobiology?

Psychobiological accounts of behaviour

To use a legal metaphor, human and animal data contribute circumstantial evidence for a biological case of behaviour. One account alone does not provide conclusive evidence: it is the sum collection of the presented evidence that is required for a conviction (acceptance of a hypothesis). It is for the (scientific) jury to decide if the evidence is sufficient to support the charge (hypothesis). If the hypothesis cannot be supported then we have to accept the null hypothesis. If this is the case then we either have to provide stronger evidence or look for another suspect.

Behavioural genetics

It cannot escape anyone's notice that genetics is an important and rapidly advancing branch of science. We only have to read the more lurid newspaper stories of man's inhumanity to his fellow man to see that genetics is foremost in forensic science (with, for example, the use of DNA testing). Fortunately, genetic science is also used in less negative circumstances, and can offer insight and hope. Recent advances in genetics, such as the Human Genome Project and Dolly the cloned sheep (Campbell et al., 1996), have focused on DNA, but the study of genetics has a much longer and more detailed history than this and has shaped the formation of our present-day views.

Evolution

The idea that species change and evolve over time is now a well-established fact. While Charles Darwin was not the first to take an evolutionary perspective, he was certainly the most influential. Darwin (1859) published *The Origin of Species* at a time when Christianity stated that God had created all species *de novo* (from scratch). Darwin's account of evolution was revolutionary at the time and brought about a change in viewpoint very quickly. His account was convincing to biologists because he used evidence to support his theory. Without this supporting evidence his theory would have attracted less attention.

Darwin's evolutionary theory

Darwin proposed that all organisms are related and share a common ancestor. His theory of descent with modification encapsulated how modern organisms are (successful) adaptations of previous generations. How did these modifications occur? The answer, he said, lies in the process of natural selection. Certain characteristics are more beneficial to the organism in a particular environment. Therefore those organisms that possess such beneficial characteristics are more likely to survive and reproduce. Via reproduction, these characteristics are passed to the next generation. Organisms that are not ideally equipped to interact with their environment stand a reduced chance of being able to survive and reproduce. The phrase often used for this is the 'survival of the fittest'; this means that those organisms that '*fit* in to' their environment are more successful at survival (note that the word 'fittest' as it is used here does not necessarily have anything to do with physical fitness). (See Activity box 6.2.)

In Activity box 6.2, you are asked to discuss how and why certain traits are more desirable than others. Natural selection is distinct from selective breeding programmes. With natural selection there is no specific plan; the environment is the influence. However, the breeding of animals is a specific, and intended, act that produces offspring with particular characteristics (as in the case of the thoroughbred racehorse).

Evidence in support of evolution

As with all good science, evidence has to be amassed to support (or refute) a theory. Darwin (and others since) has presented a great deal of evidence in support of evolution via natural selection. The evidence for the case of evolution derives from the following:

- Biogeography Why are some organisms indigenous to particular environments and not others? These organisms are the best fit for their unique environment.
- Fossil records Looking at different geological layers reveals changing fossils. These changes permit the palaeontologist to chart the evolution of species. For example, the change in the size and shape of the skull is important in tracing our ancestors. As new fossils are found, established views are challenged and our understanding of evolution advanced.
- Structural similarity Across species there are comparative similarities. Arms, paws, flippers and wings have similar skeletal structures but different functions (see Figure 6.3). In evolutionary terms, these have developed from a common ancestor.

ACTIVITY BOX 6.2

Rules of attraction

What do you find attractive in another person? I would imagine you would provide a list of physical and personality traits. The male of our species is likely to prefer females with larger hips.

There has been a lot of talk in the media regarding size zero and the booty. That is the female bottom. Why would having large bottom be a so desirable? Beyonce Knowles, Jennifer Lopez and Kylie Minogue are rarely out of the newspapers and the photographs nearly always focus on their rears.

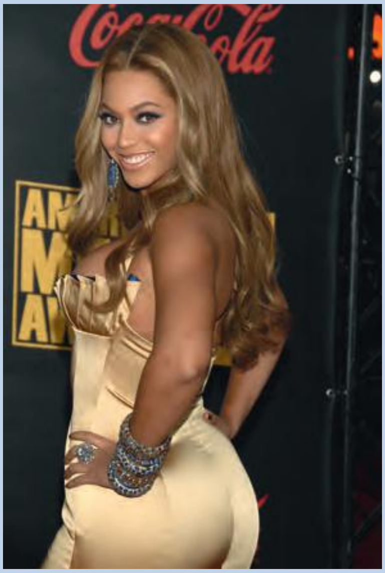


Photo 6.1

Ask yourself these questions:

1. Why has the body evolved this was?
2. Does the opposite sex like it?
3. Why does the opposite sex like this shape?
4. How would you assess the desirability of a booty?
5. Is the desirability of the booty a fixed trait?

Fortunately, Singh (1993) has provided a more scientific analysis of the desirability of body shape related to the hips. A waist-to-hip ratio (WHR) that is like an hourglass shape is seen as desirable and conferring many positive attributes. Similarly, males are rated more favourable if they have fuller beards (see Barber, 1995). Like the WHR, a beard is linked to dimensions that are seen as positive on males. I particularly look forward to reading the research that indicates a positive appraisal of male pattern baldness and a beer gut (particularly since there has been an increase in both these desirable features since the first edition).

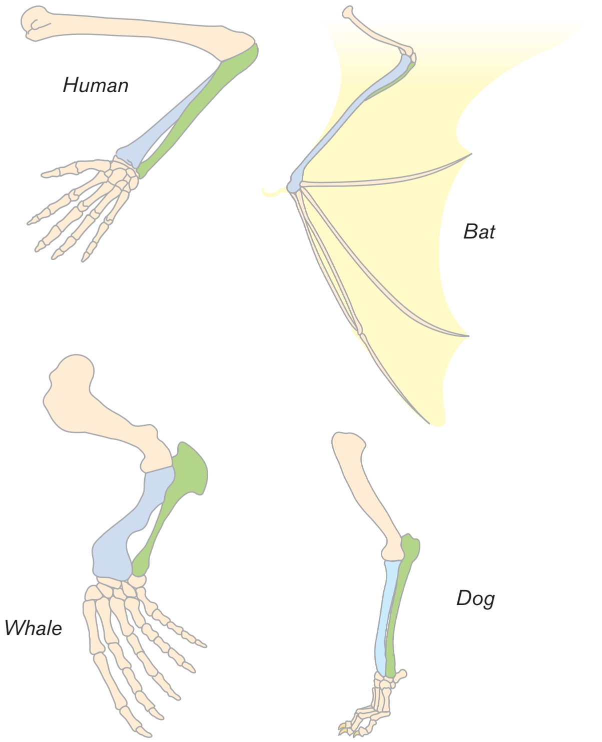


Figure 6.3 The bone structure in the limbs of various animals; in accordance with evolutionary theory these structures share a common ancestor

- Embryology Comparing the development of embryos reveals that there are similar stages across species. Campbell et al. (1999) point out that both human and fish embryos go through a phase of possessing gills. As the embryo develops, these similarities are reduced and the embryos take on the unique characteristics of their species. (But note that we do not start out as fish!)
- Molecular biology Darwin did not have the benefit of modern science and our knowledge of DNA (more of which later). However, molecular biology supports Darwin's account of evolution and the fossil evidence. Ultimately, we share common strands of DNA with other organisms, and some are closer than others (see Figure 6.4).

The organism and the environment

The Darwinian account is a very good example of how the environment changes biology and behaviour, albeit over an extended period of time. Johnston and Edwards (2002), who provide an integrative model of the development of behaviour, have acknowledged the importance of the environment. Here the development of behaviour is a product of interactions between genetics, the environment and perception. Essentially behaviour will be determined not purely by genetic makeup, but also by experiences, interpretations and perceptions of the environment.

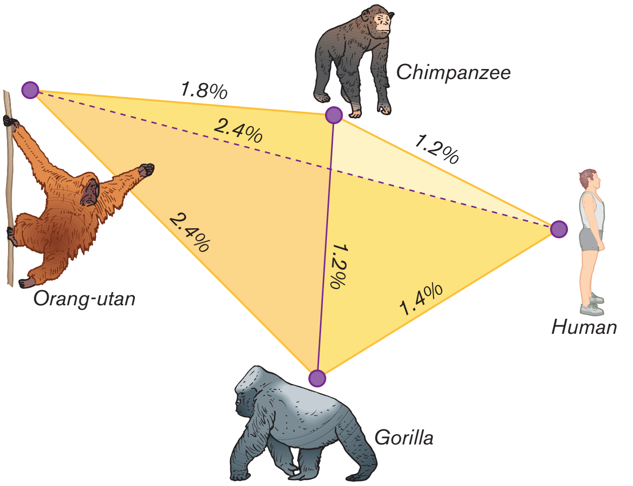


Figure 6.4 The close relationship of species: the human race is not created as new but has evolved from previous species; the human is a close relation of other species (Source: adapted from Lewin, 1984)

Self-test: Describe Darwin's account of evolution and its hereditary traits.

Mendelian genetics

A monk called Gregor Mendel (1822–84) was working on inheritance at the same time as Darwin was explaining evolution. Mendel was able to account for differences in conspecifics (members of the same species). Mendel's work (see Campbell et al., 1999) accounted for the inheritance of behavioural as well as physiological and anatomical characteristics. His evidence was derived from his experiments with pea plants. Fortunately, we can extrapolate his work with peas to human inheritance.

Mendel studied seven different observable characteristics of peas, such as seed colour and flower colour. Regardless of the characteristic he looked at, the principles remained the same.

He examined dichotomous traits; that is, the characteristics that are in one form or another. One dichotomous trait he observed in the pea was whether the seed was yellow or green. This variant in colour is called a trait. If a yellow-seeded plant (Y1) is inbred with another yellow-seeded plant (Y2) then the resultant offspring is also a yellow-seeded plant (Y1:Y2). The same goes for the green-seeded plants (G1:G2). These plants are true breeding lines and produce the same trait in subsequent generations (yellow seeds or green seeds).

But what happens if a true breeding yellow-seeded plant is crossed with a true breeding green-seeded plant? As shown in Figure 6.5, the result is a first generation of yellow-seeded plants. No green seeds can be observed. Mendel then took the first-generation plants and crossed them with one another. This produced a second generation of pea plants. In the second-generation pea plants, 75 per cent had yellow seeds and 25 per cent had green seeds.

Only one trait appeared in the first-generation cross – this

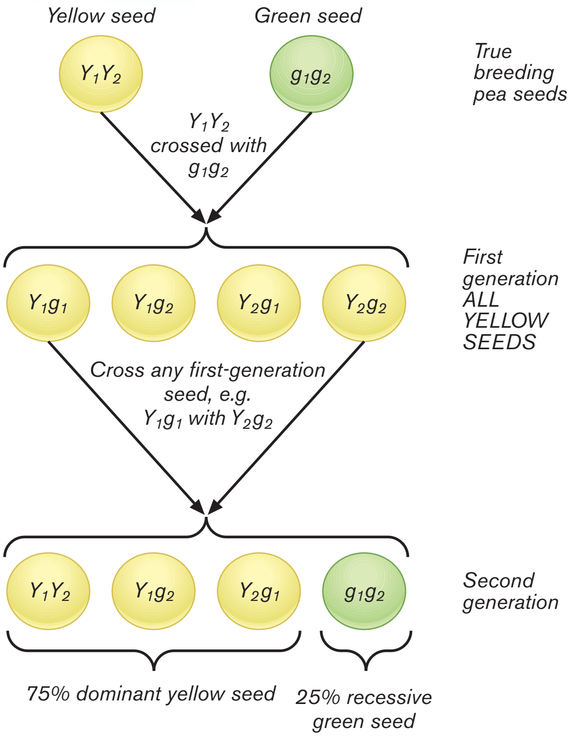


Figure 6.5 Mendelian genetics: the inheritance of dominant and recessive alleles in the pea plant have shown how traits such as pea seed colour (or eye colour) are passed on to subsequent generations

is the *dominant trait* (yellow seeds). The recessive trait (green seed) was not expressed because it was overridden by the yellow seed trait. In the second generation, green-seeded pea plants were produced. Despite not being observed in the first-generation plants, the recessive trait was passed on to the second generation. The first-generation plants were carriers of the recessive trait, but because it was combined with a dominant trait it was not observably expressed. Thus there is a difference between observed traits and genetic traits. What is observed is called the phenotype and what is transmitted genetically is called the genotype. What you see (the phenotype) and what you get (the genotype) can be different (see Activity box 6.3).

The observations made by Mendel can be translated into the language of modern genetics. The fact that there are dichotomous traits for pea characteristics means that there is a gene for yellow and a gene for green seeds. Each successive generation inherits two of these genes, one from mother and one from father or, in the case of the peas, one from a yellow-seeded plant and one from a green-seeded plant. If the two genes are controlling the same trait (e.g. seed colour) they are referred to as alleles. The random inheritance of alleles permits a number of combinations, as can be seen in Figure 6.5.

Huntington's disease: dominant allele in action

The principles of Mendelian genetics can be applied to Huntington's disease (HD). This is a case of a dominant allele in action (as with Mendel's yellow seeds). HD is a progressive disorder that is characterised by motor disturbances and a subsequent cognitive decline. The manifestation of symptoms occurs between the ages of 30 and 45. The significance of this late onset is that reproduction may have occurred and therefore HD is passed on to offspring. An early onset would minimise the opportunity to reproduce.

The reason someone contracts HD is because of a dominant allele for HD (H). When this dominant allele is combined with a recessive allele (*h*) the person will develop HD. A parent who has an H*h* genotype will pass on either the H or the *h* allele to the offspring. In Figure 6.6, it can be seen that each parent has two alleles. These are divided during reproduction into the egg or sperm. For example, if the father has a genotype of H*h* then the sperms produced will either be H or *h* carriers. When this is combined with an *hh* mother (the eggs contain the recessive allele *h*), there is a 50% chance of the dominant H allele being expressed in the offspring.

ACTIVITY BOX 6.3

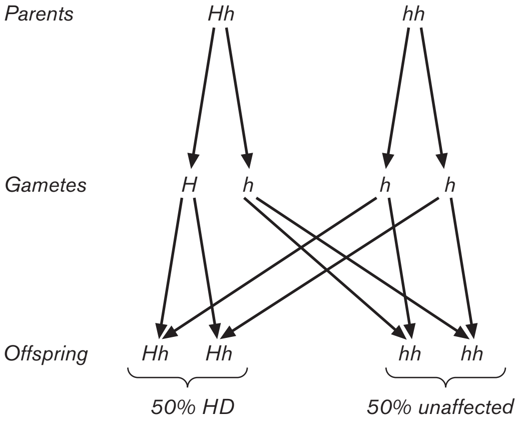
There goes my hero!

Genetic manipulation has long been at the heart of the superhero. Average male Peter Parker was bitten by a mutant spider, which, in the process, passed its DNA into him. This was integrated into Peter Parker's genome and the result was Spiderman. David Banner, a nice man, had a large dose of radiation that altered his genes. The result – the Incredible Hulk. Clark Kent (AKA Superman) is not just your average journalist, but, in fact, an alien who was the product of superhero breeding – an example of when two superheroes love each other very much! And now we have superheroes with a particular gene running all over America, but they all have different powers. Is it the same gene or a variant? What is the basis of the different powers?

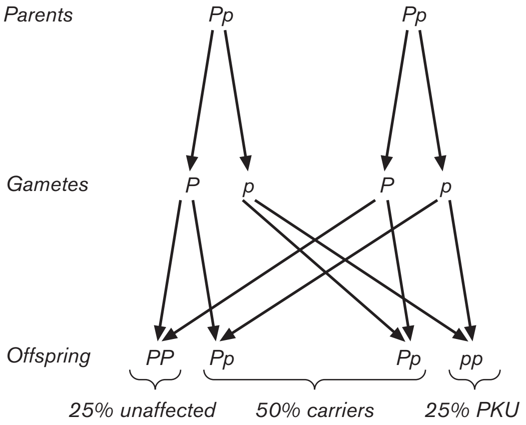
So superheroes are of genetic making. But what of Batman? Unfortunately, millionaire Bruce Wayne did not have a happy childhood and this changed his life.

Using the knowledge of genetics determine how you may selectively breed a series of superheroes. Extrapolate from Mendel's pea plants and see what successive generations may look like.

What will the role of the environment be? For example, David Banner may meet the perfect partner and be very happy, they may have a child, but the first time that child gets told off. . .?



(a) Huntington's disease – dominant allele (H)



(b) PKU recessive allele (p)

Figure 6.6 Mendelian genetics applied to (a) Huntington's disease (HD), and (b) Phenylketonuria (PKU): a dominant allele is responsible for HD and a recessive allele is responsible for PKU

Source: adapted from Plomin et al., 1997

PKU: recessive allele in action

Phenylketonuria (PKU) is a form of mental retardation and is due to a recessive allele. If a recessive allele is to be expressed there have to be two copies of it. Remember that the green seeds in Mendel's second-generation pea plants were expressed only when the genotype was G1:G2. Here there was no yellow seed to dominate. Similarly, with PKU, the disorder is only expressed when there is no dominant allele (P) to override the recessive trait (*p*). Therefore, only 25% of offspring will have the disorder and 50% will be carriers of PKU but will not contract the disorder (see Figure 6.6). Here again is an example of the genotype being very different from the phenotype. A person can be a carrier of PKU but not express PKU.

Self-test: What did Mendel demonstrate in plants and how does it relate to humans?

The endophenotype

Not all disorders have simple Mendelian transmission – in fact, many are complex polygenetic disorders. An endophenotype is an intermediate account of genes and environment that 'was adapted for filling the gap between available descriptors and between the gene and the elusive disease processes' (Gottesman and Gould, 2003). Thus between the genes that are most likely to cause a disorder (e.g. ADHD) and the symptoms (e.g. impulsivity) is a theoretical account of the disorder (e.g. faulty behavioural inhibition) that links the physical (gene/brain) to the behavioural.

Criteria have been reported for the identification of endophenotypes as follows (Gottesman and Gould, 2003):

1. The endophenotype is associated with illness in the population.
2. The endophenotype is heritable.
3. The endophenotype is primarily state independent, i.e. it will manifest itself in an individual whether or not they are symptomatic.
4. Within families the endophenotype and illness co-occur.
5. The endophenotype found in affected family members is found in non-affected family members at a higher rate than in the general population.

Self-test: What is an allele?

Chromosomes and inheritance

The process of inheritance described by Mendel has a biological basis. The examples of HD and PKU demonstrate that the genes (alleles) that each parent has are not expressed in every gamete (sperm or egg). The genes are divided. Genes are located on chromosomes that are contained in the nucleus of a cell. Chromosomes come in matched pairs; humans have 23 pairs. The alleles for a particular trait (e.g. HD or PKU) are found in the same location on each chromosome.

The exception to this rule is the sex chromosomes. These are called X and Y. Females have two X chromosomes (XX) and males have an X and a Y chromosome (XY). All chromosomes apart from sex chromosomes are called *autosomes*.

The pairs of chromosome are divided between gametes by cellular division called *meiosis* (see Figure 6.7). A different path of meiotic cell division occurs in sperm and eggs. Each gamete has half the full complement of chromosomes. Thus meiosis reduces the chromosomes from the diploid number (46) to the haploid number (23) of unpaired single chromosomes. With a sperm and an egg each having 23 unpaired chromosomes, fertilisation allows them to pair up and form a zygote.

Once created, a zygote grows through cellular division. This cellular division is called mitosis. During mitosis the cell doubles its chromosomes before division (see Figure 6.8). This doubling permits the new cells to have a full

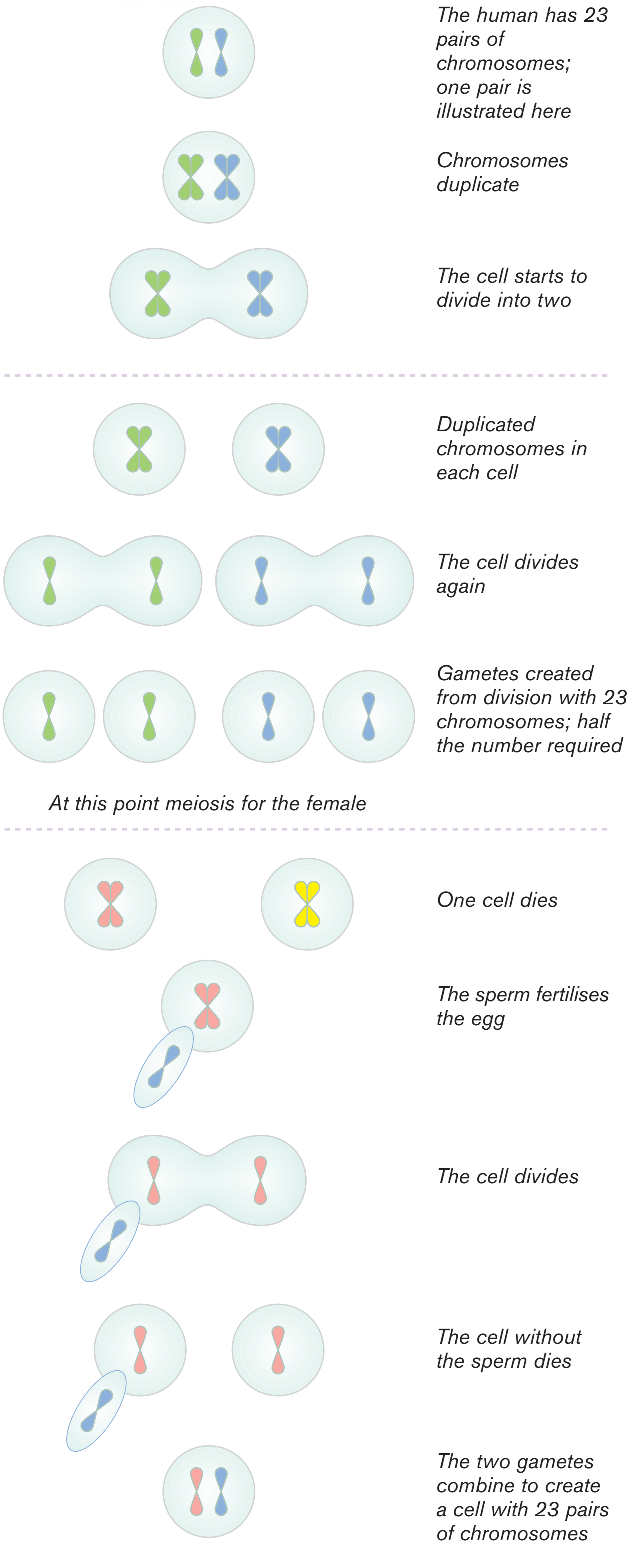

The human has 23 pairs of chromosomes; one pair is illustrated here
Chromosomes duplicate
The cell starts to divide into two
Duplicated chromosomes in each cell
The cell divides again
Gametes created from division with 23 chromosomes; half the number required
At this point meiosis for the female
One cell dies
The sperm fertilises the egg
The cell divides
The cell without the sperm dies
The two gametes combine to create a cell with 23 pairs of chromosomes

Figure 6.7 Meiosis: pairs of chromosomes are divided between gametes; a different path of meiotic cell division occurs in sperm and eggs

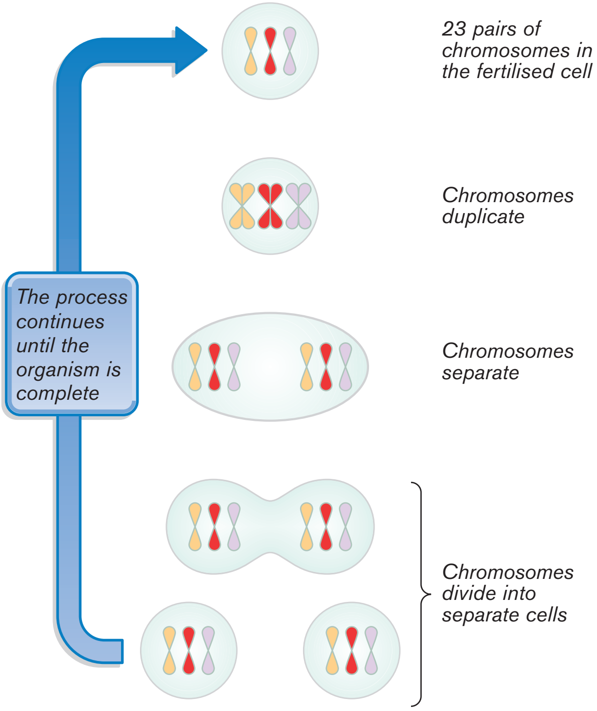

23 pairs of chromosomes in the fertilised cell
Chromosomes duplicate
The process continues until the organism is complete
Chromosomes separate
Chromosomes divide into separate cells

Figure 6.8 Mitosis: during mitosis the cell doubles its chromosomes before division, which provides new cells with a full complement of chromosomes

complement of chromosomes. Mitotic division occurs until the organism is complete.

Self-test: Describe the processes of meiosis and mitosis.

Genes that are located closely on the same chromosome are more likely to be inherited. This is referred to as linkage. However, linkage does not obey Mendelian rules. To account for partial linkage from chance (50%) to full linkage (100%) Morgan (see Campbell et al., 1999) suggested crossing over. The chromosomes in meiosis duplicate and cross over each other at a random point. At the point of the crossover they break and reattach with the other chromosome (see Figure 6.9). With the occurrence of crossing over it is unlikely that intact chromosomes will be passed on to the next generation. This process ensures the genetic diversity of a species.

Self-test: How does crossover affect the chromosome?

DNA

You will be familiar with the term DNA (deoxyribonucleic acid) and its label as the 'building block of life'. But what is it and what does it do?

DNA has two functions. First, it replicates itself to make new cells and, second, it eventually makes proteins and determines the function of the cell. Proteins are extremely important and constitute 50% of the dry weight of a cell (see

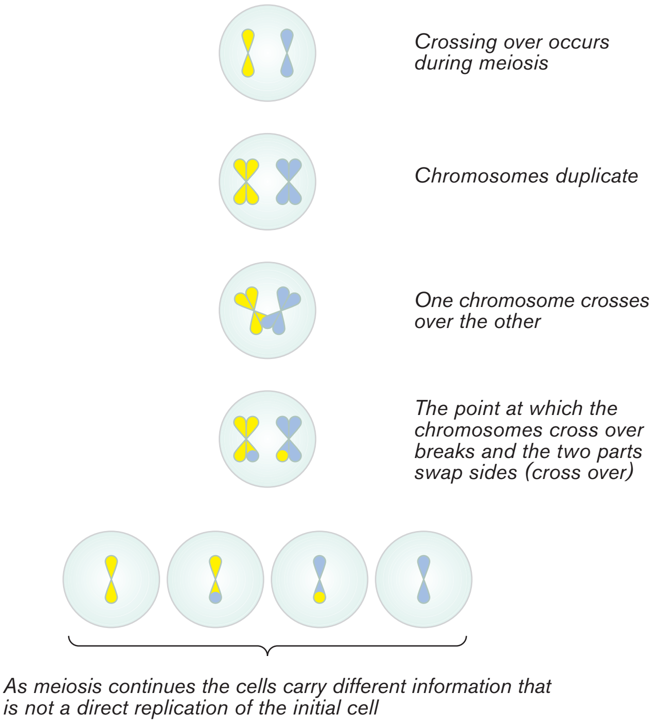

Crossing over occurs during meiosis
Chromosomes duplicate
One chromosome crosses over the other
The point at which the chromosomes cross over breaks and the two parts swap sides (cross over)
As meiosis continues the cells carry different information that is not a direct replication of the initial cell

Figure 6.9 Crossover: not all genes are faithfully copied during cellular division; crossing over accounts for differences

Campbell et al., 1999). There are many thousands of proteins that are used in a variety of ways. It is beyond the scope of this chapter to provide an exhaustive account of proteins, but it is worth highlighting one example. In Chapter 7, we shall see how cells communicate with each other in the nervous system. This is achieved by a transmitter molecule (a sequence of amino acids that make up polypeptides and proteins) interacting with a receptor protein.

What is DNA?

Each chromosome is made up of two strands of DNA. The strands of DNA are made up of chemicals called nucleotide bases that are attached to a sugar phosphate support or backbone (Figure 6.10). The two strands of DNA are held together by a mutual attraction of the nucleotides. This double-stranded structure is the famous double helix (Crick and Watson, 1953). The attraction of nucleotides can be seen in Figure 6.11. This pattern of bonding means that each strand of DNA is the complement of the other.

What is the function of DNA?

There are two functions of DNA: replication and protein synthesis.

Replication

Looking more closely at mitotic cell division, here DNA replicates itself before another cell can be created. During DNA replication the two strands of nucleotide bases unravel. The exposure of the unravelled nucleotide bases attracts their complement from unattached bases in the nucleus. The unravelled strand now has a full complement of attached nucleotide bases and is therefore identical to the original.

This process sounds simple but errors in the replication can occur. Such errors are called mutations. Most mutations disappear though evolution and survival of the fittest. Some mutations remain, such as those responsible for HD and PKU. Mutations result in the different alleles that are responsible for HD being expressed. These mutant alleles are called polymorphisms. Mutations are rarely beneficial but, if they are, they are passed on to successive generations.

Self-test: What is DNA?

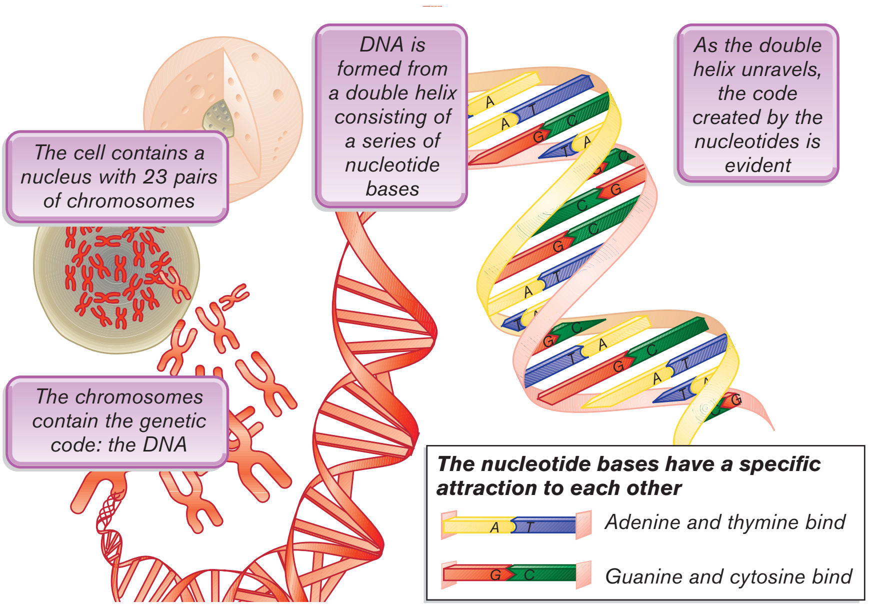
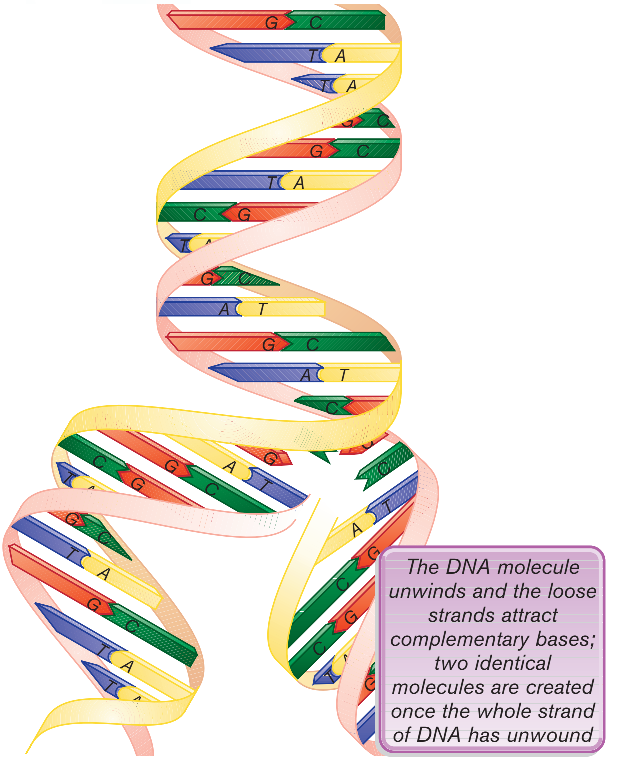

The cell contains a nucleus with 23 pairs of chromosomes
DNA is formed from a double helix consisting of a series of nucleotide bases
As the double helix unravels, the code created by the nucleotides is evident
The chromosomes contain the genetic code: the DNA
A
T
G
C
The nucleotide bases have a specific attraction to each other
Adenine and thymine bind
Guanine and cytosine bind

Figure 6.10 DNA: as a chromosome unravels, the double helix can be seen; the double helix is formed of nucleotide bases on a phosphate backbone



The DNA molecule unwinds and the loose strands attract complementary bases; two identical molecules are created once the whole strand of DNA has unwound

Figure 6.11 The bonding of the double helix: the nucleotide bases have one partner to which they are attracted

Protein synthesis

The nucleotide bases are a code. It is this code that permits the construction of amino acids. A series of amino acids can then make up enzymes, proteins and polypeptides (small proteins).

The code for an amino acid is based on a sequence of three nucleotides (see Figure 6.11). The code from DNA has to be transported outside the nucleus before the amino acid sequence can be formed. The process of reading the DNA code is called transcription (see Figure 6.12). During transcription, a strand of DNA acts as a template for the creation of messenger ribonucleic acid (mRNA). Messenger RNA carries the code from the nucleus to the cytoplasm of the cell. Unlike the replication of DNA during mitotic cell division, mRNA is not an exact copy. In the case of mRNA, uracil substitutes for thyamine. The three-nucleotide bases on the strand of mRNA are called codons. Each codon specifies an amino acid (Figure 6.13).

The next step in protein synthesis is to read the message contained in the strand of mRNA (Figure 6.12). Ribosomes are the translators of the sequence of nucleotide bases contained in mRNA. Ribosomes read the sequence and add amino acids as the codons instruct. The amino acids are taken to the ribosome by transfer ribonucleic acid (tRNA). As the ribosome reads the codons, each specific tRNA molecule adds amino acid after amino acid. Eventually the ribosome reaches a codon that indicates that the protein is complete. This codon is like the full stop at the end of a sentence. Thus the sequence on the DNA strand is translated into a sequence of amino acids that go on to make proteins.

Self-test: Describe the differences between mRNA and DNA.

Why should psychologists look at genes?

Genetics is clearly a biological science. The examples used to illustrate genetic principals are medical conditions. Other more subtle behaviours may also have a genetic underpinning. In fact, there is a great deal of overlap between the biological sciences and the behavioural sciences.

The understanding that there is a genetic contribution to behaviour has been central to psychological discourse and in particular the nature–nurture debate (see Chapter 5). This has been a long-established argument about the relative contribution of our biology (nature) and the environment (nurture) to behaviour. Often the dialogue between students of psychology regarding nature and nurture adopts polarised points of view – it is either one or the other. Are we intelligent because we have inherited genes for intelligence or have we learned to be intelligent? A more accurate explanation is that the two interact.

One way in which psychologists have sought to understand the genetic and environmental input to behaviour is to look at twins. There are numerous twin studies that have investigated various behaviours. (A more elaborate account of twin studies and intelligence can be found in Chapter 30.)

The rationale behind such studies is to do with the degree of genetic similarity in twins. There are two types of twin: monozygotics (from one zygote) and dizygotic (from two zygotes). Monozygotic twins are genetically identical, whereas dizygotic twins are as genetically similar as any two siblings in a family. Of course, this alone does not help disentangle the nature–nurture issues. Twins are most likely to share the same environment, which could have a great impact on their behaviour. To minimise environmental factors and to focus on the genetics, twins who have been reared apart have been studied. These twins do not share the same environment. The question asked of these groups is to what extent they are similar or different.

Self-test: What are the main functions of DNA?

DNA and psychology

The growth of biotechnology has permitted a more detailed analysis of genetics. The twin studies have looked at the phenotype with some speculation about the genotype. Now it is possible to look at the actual individual genes themselves. Increasingly, the modern techniques of molecular biology are telling us about the specific genetic

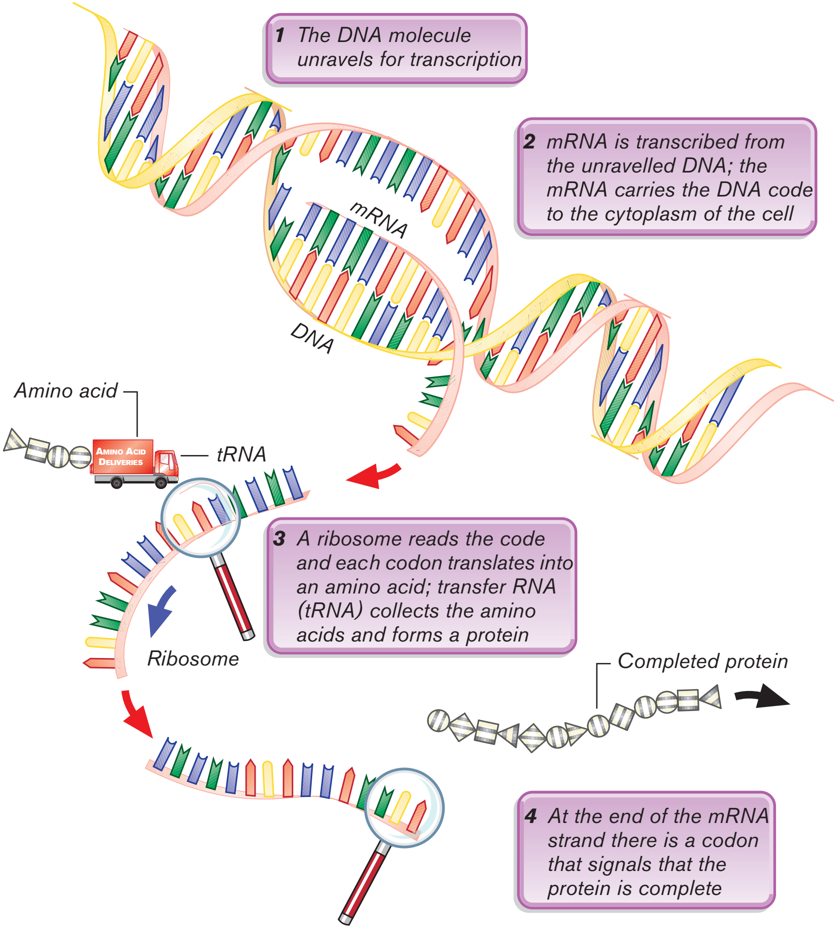

1 The DNA molecule unravels for transcription
2 mRNA is transcribed from the unravelled DNA; the mRNA carries the DNA code to the cytoplasm of the cell
mRNA
DNA
Amino acid
Amino Acid Deliveries
tRNA
3 A ribosome reads the code and each codon translates into an amino acid; transfer RNA (tRNA) collects the amino acids and forms a protein
Ribosome
Completed protein
4 At the end of the mRNA strand there is a codon that signals that the protein is complete

Figure 6.12 Transcription: the genetic code is read in a process called transcription, which makes the protein

RESEARCH METHODS BOX 6.2

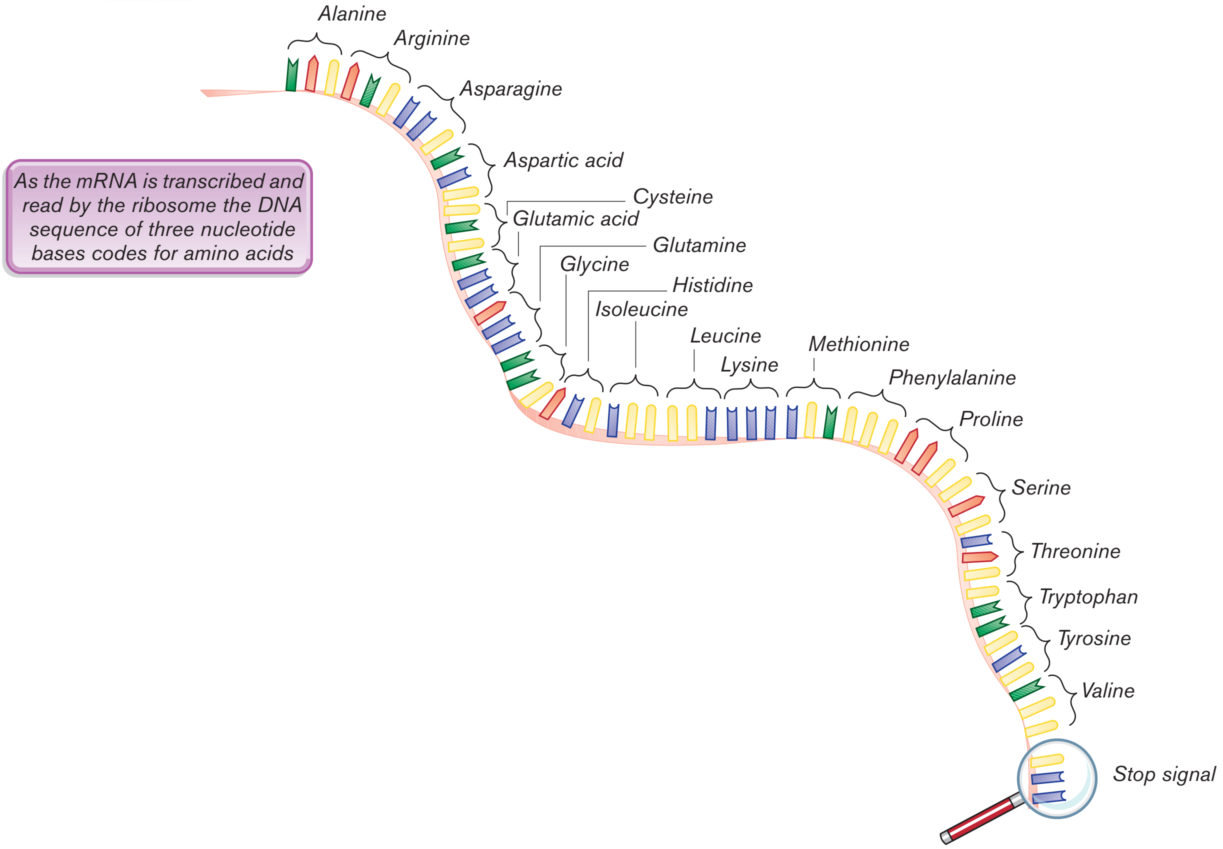
A gene for bungee jumping?

The idea that there is a gene for sensation-seeking (SS), or novelty-seeking (NS), has been investigated (Ebstein et al., 1996). The early focus for a gene for SS has focused on the DRD4 gene. This is a gene that makes a receptor for dopamine. Dopamine is a neurotransmitter that underlies SS. Since the initial findings that there is a gene for SS a number of other studies have been conducted.

With the scientific rigour of molecular biology one would assume a consistent methodology across laboratories. A review by Lusher et al. (2001) points out, however, that there are many methodological inconsistencies.

- Ethnic differences: different ethnic groups have been used; there are genetic variants across ethnic groups, therefore an SS gene may be different in one group from that in another.
- Age: studies that have not found an association between the DRD4 gene and NS in some cases have used older participants; NS declines with age.
- Measures of personality: there are a number of scales to assess NS; the reports used different scales.
- Sex: some studies used only males while others used only females.

The overall position at present is that the DRD4 gene is not associated with NS (Burt et al., 2002; Strobel et al., 2003). The search continues for a gene for NS and to find out what the DRD4 gene does. The DRD4 gene has been linked with severity of addiction (Lusher et al., 2000), fear (Falzone et al., 2002), nicotine craving (Hutchison et al., 2002), attention deficit hyperactivity disorder (Grady et al., 2003), gambling (Comings et al., 2001) and many more behaviours. The task now is to understand how these genes work to influence behaviour (Plomin, 2002).



As the mRNA is transcribed and read by the ribosome the DNA sequence of three nucleotide bases codes for amino acids

Figure 6.13 The genetic code: the nucleotide bases code for amino acids, which make proteins. Some examples are illustrated above

basis of disorders such as Alzheimer's disease (Larner and du Plessis, 2003), schizophrenia (McDonald and Murphy, 2003) and drug addiction (Li et al., 1997). While understanding the underlying genetics of disorders is clearly important, behavioural geneticists have also looked at personality traits, e.g. aggression in children (Schmidt et al., 2002). The search for an understanding of the genetics of personality is an ongoing quest, but some headway has been made. One personality trait that has received a lot of attention is sensation seeking. The possibility that there is a gene for sensation seeking and the methodological limitations of some studies are addressed in Research methods box 6.2.

Molecular biotechnology and psychology

In order to investigate and experiment with DNA, numerous copies have to be made (you need enough DNA to work with). This is known as gene cloning. Once the DNA has been isolated, a number of studies can be conducted (see Stephens et al., 2002). The following is a list of techniques that you may encounter and what they do or can tell us:

- The **polymerase chain reaction (PCR)** This is one way used to amplify (clone) a specific strand of DNA; during a PCR the DNA is replicated many times by an enzyme.
- **Transgenic mice** See Carter and Murphy, 1999.
- **Knock in** The harvested DNA from the PCR can be incorporated into a mouse zygote; the mouse then codes for this new gene.
- **Knockouts** Here a particular gene is deleted or knocked out.
- **Southern blots** A process looking for a particular sequence of DNA, thus genes can be identified; this is important for evolutionary psychologists as we can see the degree of relatedness between species.
- **Northern blots** A process that confirms which cells are using a specific gene.

The Human Genome Project and beyond

This is a collaborative project that has set out to determine the sequence of each human gene. Two of the primary purposes of the project are to identify all the genes in human DNA and to determine the sequences of the chemical base pairs that make up human DNA.

Frequent reports in the media identifying the location of a gene responsible for some disorder or disease are inescapable. Genetics is being incorporated in forensic science, diagnosis, gene therapy and pharmaceutical design. Since the 19th century, when Darwin and Mendel presented their theories of evolution and inheritance, our understanding of genetics has increased enormously, but even in the 21st century it is still in an early period of development.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Compare and contrast the different approaches in psychobiology, and the different methodologies they use.
2. Demonstrate an understanding of the use of animals in UK research.
3. Describe the basic infrastructure required to assess animal models of behaviour.
4. Provide an account of evolution and inheritance.
5. Summarise the role and action of DNA and its use by psychologists.

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2 How has evolution favoured some characteristics and not others?

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3 We are just expressions of our DNA. Discuss.

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Plomin, R., DeFries, J. C., McClean, G. E. and Rutter, M. (2000) *Behavioral Genetics*, 4th edn. New York: W. H. Freeman & Co.

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Web links

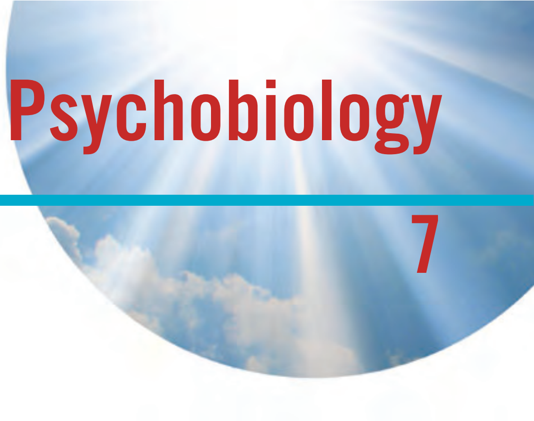
British Union for the Abolition of Vivisection: http://www.buav.org/

Darwin Centre: http://www.nhm.ac.uk/darwincentre/

Genome Project: http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml

Home Office: http://scienceandresearch.homeoffice.gov.uk/animal-research/

Human Research Defence Society: http://www.rds-online.org.uk



7

The brain, neurons and nervous systems

Route map

In this chapter, you will be introduced to the nervous system and its numerous divisions. The focus will then move to the brain, looking first at large structures and then at small units of activity. In the second part of the chapter, you will be introduced to neural communication and how the action of drugs can influence this process. Finally, we look at the action of hormones as communicators within the body.

Introduction

Psychobiology is concerned with how brain functions shape behaviour (see Focus point 7.1). The brain as part of the nervous system can be investigated at a number of levels. The basic processes of brain activity and functions are addressed within this chapter. However, remember that neuroscience is a dynamic and rapidly changing discipline, and changes in theories will occur.

FOCUS POINT 7.1

Watson's view

Watson (cited in Barker, 2003) said that 'If the brain were so simple we could understand it, we would be so simple we couldn't.'

The nervous system

The nervous system has many subdivisions (see Figure 7.1). In the first instance the nervous system can be split into two branches: the central nervous system (CNS) and the peripheral nervous system (PNS). The CNS is contained within the skull and spine, whereas the PNS is on the outside of these structures (see Figure 7.2). The CNS comprises the brain and the spinal cord. The brain has evolved as an outgrowth from the spinal cord.

The PNS is further subdivided into the somatic nervous system (SNS) and the autonomic nervous system (ANS). The SNS interacts with the external environment. It receives sensory information along afferent nerves (e.g. signals from eyes, skin, muscles etc.) and relays the information to the CNS. The CNS acts on this incoming information and sends motor signals via efferent nerves to the skeletal muscles (e.g. your hand grips a pen). Therefore, afferent nerves carry sensory information and efferent nerves send out motor commands.

The ANS interacts with the internal environment (internal organs). Like the SNS, the ANS comprises afferent and efferent nerves. However, the ANS has efferent nerves that can be further subdivided into the sympathetic nervous system and the parasympathetic nervous system. The difference between these two systems is based on location. The sympathetic nerves project from the CNS in the lumbar and thoracic regions, while the parasympathetic nerves project from the brain and the sacral region (see Figure 7.3).

In general, when the sympathetic nervous system is activated the person/animal is aroused. Energy resources are mobilised ready for flight or fight – in a threat situation your heart rate increases and your muscles receive more energy either to run away or stay and fight. (The psychobiology of fear and emotion will be covered in greater depth in Chapter 10.) The amount of stimulation an internal organ receives depends on the input of sympathetic and parasympathetic nerves. Parasympathetic neurons act in the opposite direction to sympathetic neurons and induce relaxation.

The majority of neurons in the PNS come from the spine. However, there are 12 nerves, called cranial nerves, which come directly from the brain. These are either purely sensory neurons or both sensory and motor neurons. The cranial nerves and their function are illustrated in Figure 7.4.

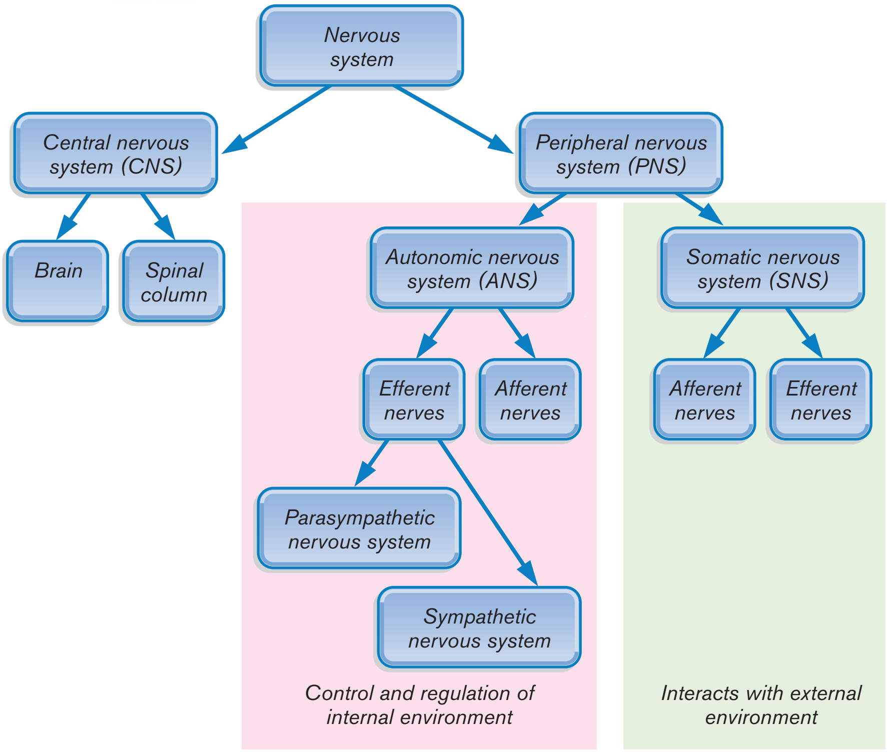

Nervous system
Central nervous system (CNS)
Peripheral nervous system (PNS)
Brain
Spinal column
Autonomic nervous system (ANS)
Somatic nervous system (SNS)
Efferent nerves
Afferent nerves
Afferent nerves
Efferent nerves
Parasympathetic nervous system
Sympathetic nervous system
Control and regulation of internal environment
Interacts with external environment

Figure 7.1 Subdivisions of the nervous system

Self-test: What are the subsystems of the human nervous system?

The central nervous system (CNS)

The brain and spinal cord are incredibly well protected. However, damage to the brain can have serious consequences, as you will know from your viewing of any hospital drama. The skull is a hard shell, a bit like a hard hat. Under the skull are three protective membranes called the meninges (see Figure 7.5). In between two of the meninges (the arachnoid membrane and pia mater) is the subarachnoid space. The subarachnoid space contains blood vessels and cerebrospinal fluid (CSF). The CSF fills the spinal canal (which runs down the spine) and the cerebral ventricles. The cerebral ventricles are chambers within the brain. If you look at the brains of boxers the lateral ventricles are connected due to deterioration of brain tissue (Unterharnscheidt, 1995). Enlarged ventricles are one of the many pathological changes seen in Alzheimer's disease (Soininen et al., 1993).

The brain is also protected by tightly packed blood vessels called the blood–brain barrier (BBB). This barrier only allows certain molecules to pass through it. Drugs that exert their effects in the brain cross the BBB.

Self-test:

- Describe the difference between the ANS and the CNS.
- Name the cranial nerves and their connections.

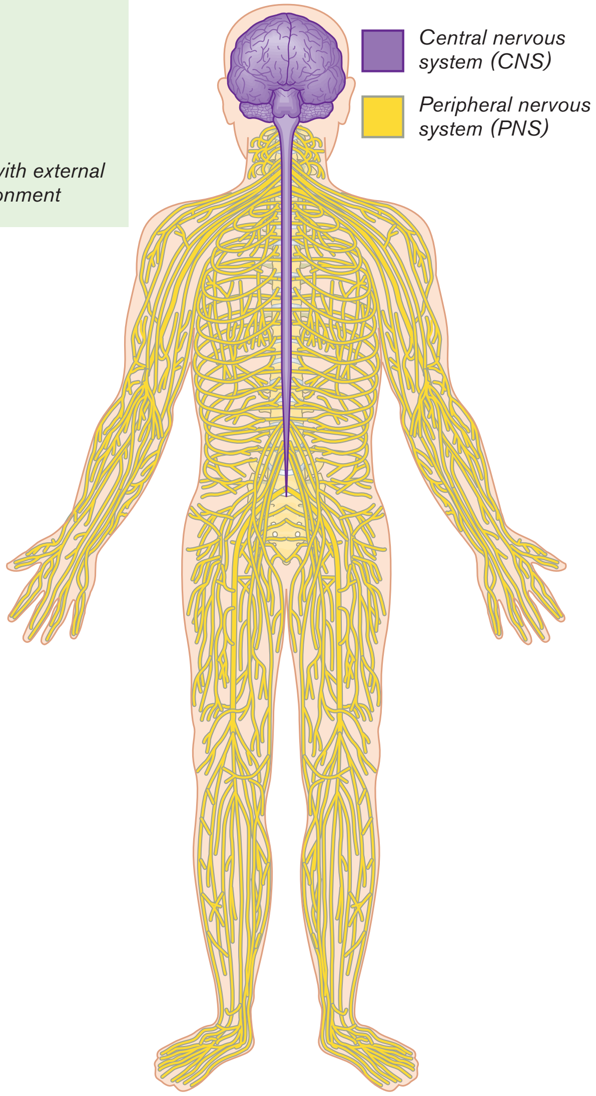

Central nervous system (CNS)
Peripheral nervous system (PNS)

Figure 7.2 The central nervous system (CNS) and the peripheral nervous system (PNS); the PNS connects to the brain and spinal column

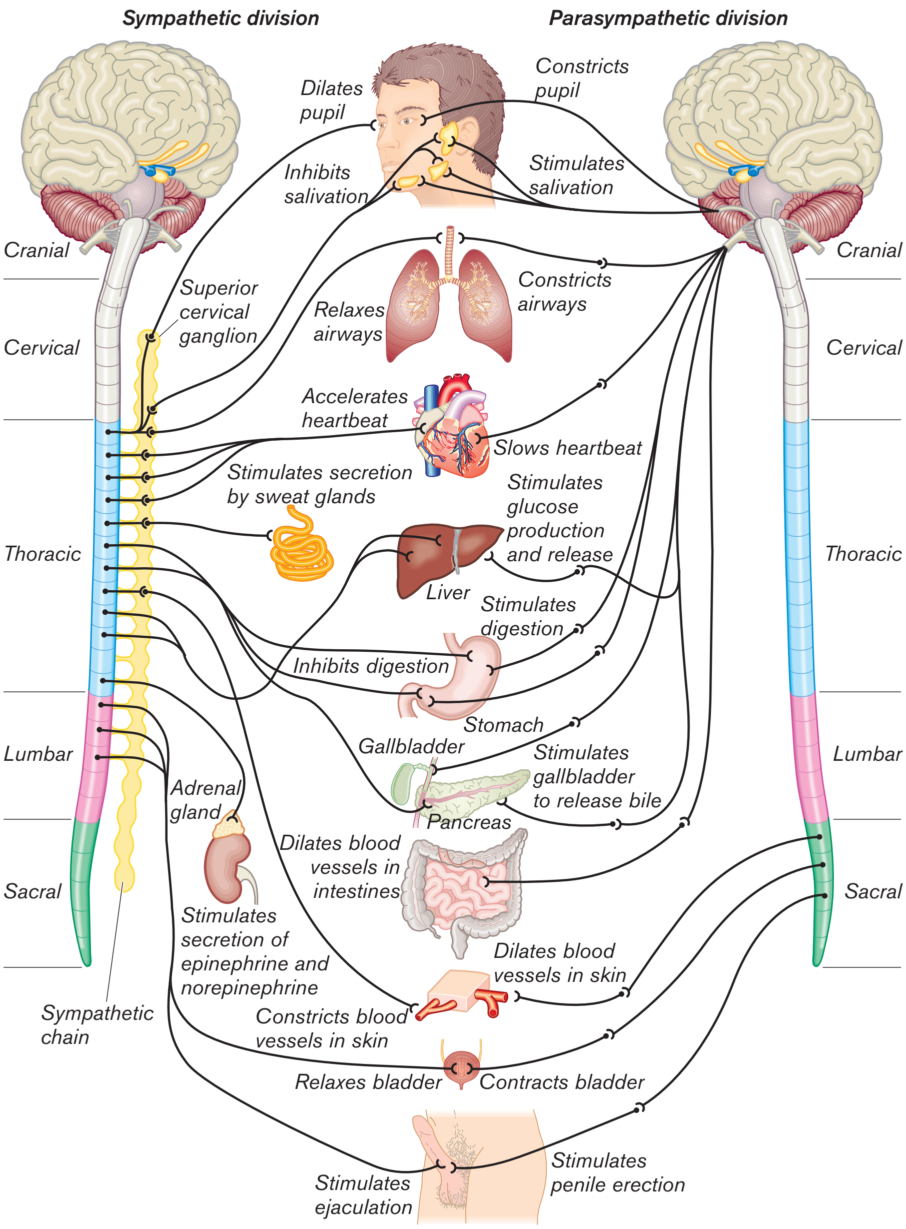

Sympathetic division
Parasympathetic division
Dilates pupil
Constricts pupil
Inhibits salivation
Stimulates salivation
Cranial
Cranial
Superior cervical ganglion
Relaxes airways
Constricts airways
Cervical
Cervical
Accelerates heartbeat
Slows heartbeat
Stimulates secretion by sweat glands
Stimulates glucose production and release
Thoracic
Thoracic
Liver
Stimulates digestion
Inhibits digestion
Stomach
Gallbladder
Stimulates gallbladder to release bile
Lumbar
Lumbar
Adrenal gland
Pancreas
Dilates blood vessels in intestines
Sacral
Sacral
Stimulates secretion of epinephrine and norepinephrine
Dilates blood vessels in skin
Sympathetic chain
Constricts blood vessels in skin
Relaxes bladder
Contracts bladder
Stimulates ejaculation
Stimulates penile erection

Figure 7.3 The sympathetic nerves of the autonomic nervous system (ANS) connect from the internal organs to the spine; the parasympathetic nerves enter at the base and the top of the spine; both systems work together, but sometimes in opposition, to control physiological processes

Source: adapted from Rosenzweig et al. (2002)

Cells of the nervous system

The nervous system uses two types of cell: neurons and support cells. The main area of interest for psychobiologists is the neuron.

Neurons

Neurons are cells that communicate to one another using electrochemical signals. Neurons come in different shapes and sizes, but all share a similar anatomy (Figure 7.6). Around the cell is the cell membrane. The cell membrane is made up of two layers of lipids (fat molecules). These lipid layers have protein channels in them that allow certain molecules to pass from inside the cell (intracellular) to outside the cell (extracellular) or vice versa. There are also receptor proteins that receive information. The importance of both types of protein will become clear later.

Neurons are the simplest unit of the nervous system and are made up of three components: the soma, the axon and the dendrites. The neuron is wrapped in a cell membrane. The soma contains the nucleus and mitochondria. The dendrites are the main recipients of information from other neurons. Incoming information is integrated at the axon hillock and an electrical message is passed down the axon to the terminal buttons. The axon is like a wire that carries

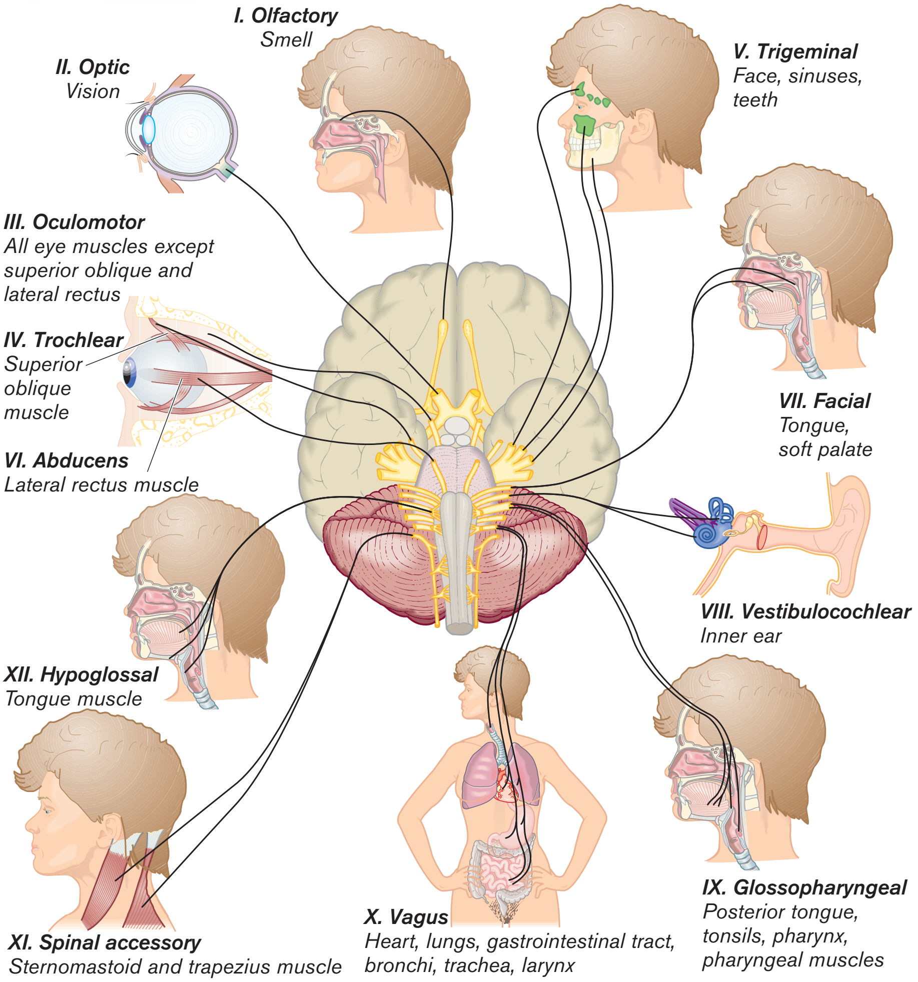

I. Olfactory
Smell
II. Optic
Vision
III. Oculomotor
All eye muscles except superior oblique and lateral rectus
IV. Trochlear
Superior oblique muscle
VI. Abducens
Lateral rectus muscle
XII. Hypoglossal
Tongue muscle
XI. Spinal accessory
Sternomastoid and trapezius muscle
X. Vagus
Heart, lungs, gastrointestinal tract, bronchi, trachea, larynx
IX. Glossopharyngeal
Posterior tongue, tonsils, pharynx, pharyngeal muscles
VIII. Vestibulocochlear
Inner ear
VII. Facial
Tongue, soft palate
V. Trigeminal
Face, sinuses, teeth

Figure 7.4 The 12 cranial nerves carry sensory and motor messages
Source: adapted from Rosenzweig et al. (2002)

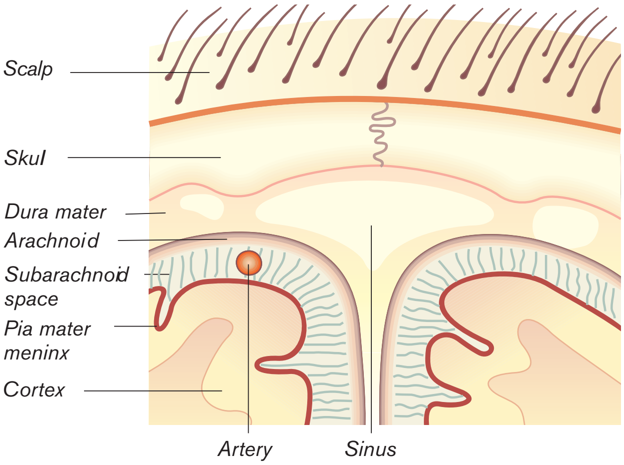

Scalp
Skul
Dura mater
Arachnoid
Subarachnoid space
Pia mater meninx
Cortex
Artery
Sinus

Figure 7.5 The brain is protected from external forces by the skull and the meninges

electricity. It is sometimes covered in a myelin sheath. Myelin is like the insulation around an electric wire. However, unlike the insulation on a wire, there are gaps in the myelin sheath. These gaps are called the nodes of ranvier. When a message is received at the terminal button a chemical called a neurotransmitter is released. This neurotransmitter is needed to cross the small gap between different neurons. This gap is the synapse. While most neurons share common features, there are some minor differences (Figure 7.7).

Groups of neuronal cell bodies are called nuclei or a nucleus. This nucleus is not to be confused with the other nucleus that contains the genetic code.

Self-test: What are the main components of a neuron?

Support for neurons

The neurons are the main actors in the nervous systems, but they require support. Satellite cells in the PNS and glial cells in the CNS provide this. As steel girders provide support

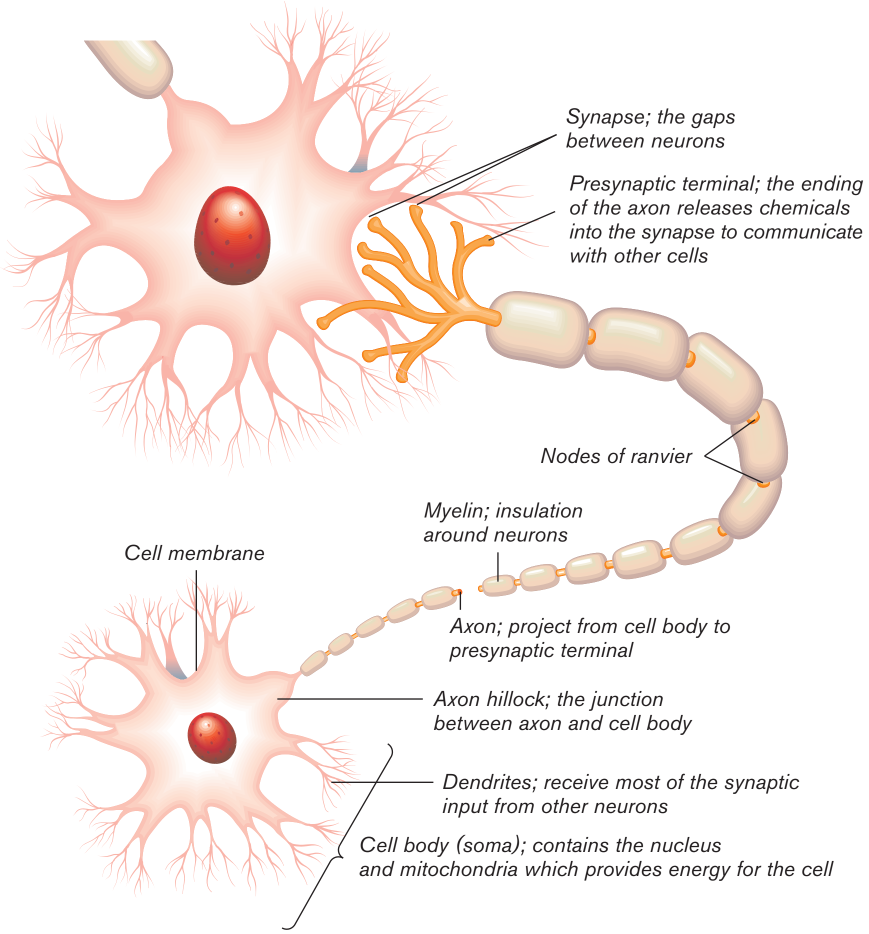

Synapse; the gaps between neurons
Presynaptic terminal; the ending of the axon releases chemicals into the synapse to communicate with other cells
Nodes of ranvier
Myelin; insulation around neurons
Cell membrane
Axon; project from cell body to presynaptic terminal
Axon hillock; the junction between axon and cell body
Dendrites; receive most of the synaptic input from other neurons
Cell body (soma); contains the nucleus and mitochondria which provides energy for the cell

Figure 7.6 The components of an average neuron

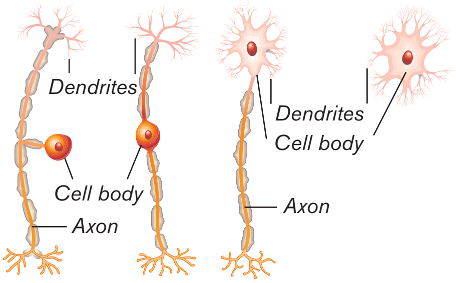

Dendrites
Cell body
Axon
Dendrites
Cell body
Axon

Figure 7.7 Different types of neurons (many types of neurons exist but they are all variations on the theme depicted in Figure 7.6)

and structure in a building, support cells provide the infrastructure to hold together neural circuits.

Developmental changes in the brain

The brain undergoes many changes during its life, from conception to death (see Figure 7.8). After conception the cells multiply (this is called mitosis; see Chapter 6). As cellular proliferation continues, the groups of cells fold in on each other to form a neural tube. The neural tube eventually becomes the ventricles and the central canal of the spinal column.

The genetic code provides each cell with its location. The cells move to their destination aided by glial cells (Rakic, 1985). Once the cell is in its location, cellular differentiation occurs. Differentiation is the process by which cells take on their unique characteristics and functions. It is this principle that stem cell research is based upon. Stem cells are undifferentiated cells that can be grown in vitro (i.e. in a testtube or other laboratory environment). When transplanted to a recipient they take on the same function as their neighbouring cells.

The axon and dendrites of the cell grow in a process called synaptogenesis. Synaptogenesis spans from embryonic and foetal development throughout life. Synaptogenesis is assisted by nerve growth factor (NGF), which is a protein that promotes the survival of only certain neurons (Levi-Montalcini, 1982). Not all the axons are myelinated at birth and myelination continues postnatally (Paus et al., 1999). Not all of the cells survive. During a process called apoptosis, unwanted neurons are programmed to die. After cell death, synapses are rearranged.

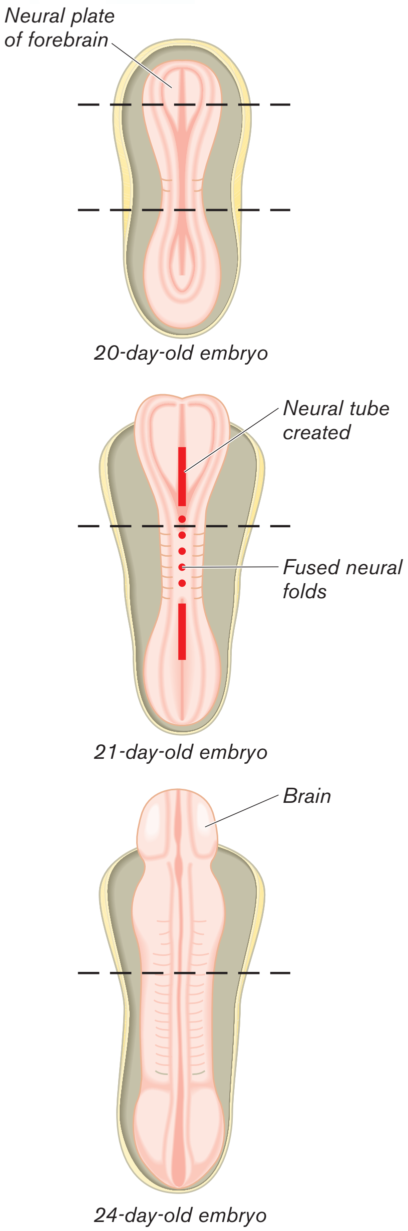


Figure 7.8 The brain develops as cells proliferate; as the number of cells increases they fold over to form a neural tube

The brain is not an organ that, once formed, remains stable until death. Throughout the brain's life it undergoes many changes that affect behaviour. The behavioural effects of brain development and the brain's exposure to experiences are clearly visible in the young child. Developmental psychology is often concerned with the child but, with an increasingly elderly population, old age has become a growth industry. A great deal of research is being conducted to determine the effects of time on the brain. Diseases such as Alzheimer's have received considerable attention, with many changes in the brain being evident (Wenk, 2003).

Neuroanatomy

During early brain development the cells become differentiated. Cellular differentiation permits the architecture of the brain to be seen. Some features can be seen clearly, others require scientific techniques to visualise them.

Location within the brain

The brain exists in three dimensions. Therefore the brain can be looked at from three orientations. There is a convention to describe where a particular orientation is or where sets of nuclei are situated (see Figure 7.9). These terms prefix an area and provide a reference point to its location (e.g. the lateral hypothalamus is in an area towards the outer edge of the hypothalamus).

Self-test: What are the names of the orientations (planes) for looking at the brain?

Brain regions

When we see a building, we see it as a whole, like the brain as a whole organ. However, the building can be divided into rooms and the rooms, in turn, can be divided into they what are made of (e.g. bricks and mortar). The levels at which we look at the brain can also be reduced from large structures to smaller components (right down to the nuts and bolts or neurons). The functions of the different regions of the brain have been associated with different behaviours. Regional function is an area of extensive research and theorising. However, ascribing a particular function to one region is not simple as all the areas communicate with each other.

Forebrain: telencephalon and diencephalon

The diencephalon is made up of the thalamus and hypothalamus. The thalamus is a relay station that receives sensory information and sends it to appropriate areas of the brain. (The role of the lateral geniculate nuclei of the thalamus is illustrated in Chapter 12.)

The hypothalamus is below the thalamus (hence the 'hypo' prefix). The hypothalamus is in close communication with the pituitary gland and has been a key site of investigation for motivational behaviours such as eating (see Chapter 10).

The telencephalon is made up of the two cerebral hemispheres containing the cortex, the basal ganglia and the limbic system.

The cortex

The convoluted area of the brain is called the cortex. The cortex is made up of peaks and troughs. The large troughs in the convolutions are called fissures. The small troughs are called sulci. In between the fissures and sulci are the gyri (peaks). The brain is a bilateral organ with two cerebral hemispheres clearly visible. The bilateral nature of the brain is not a complete mirror image, but it is close. A fissure

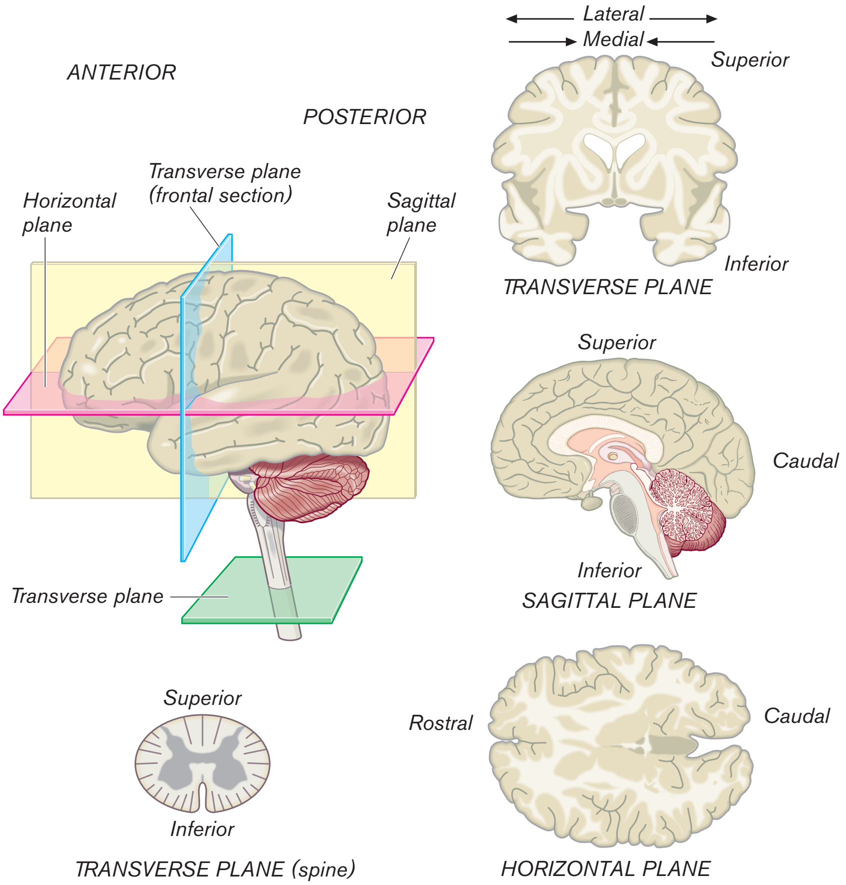

ANTERIOR
POSTERIOR
Transverse plane (frontal section)
Horizontal plane
Sagittal plane
Transverse plane
Lateral
Medial
Superior
Inferior
TRANSVERSE PLANE
Superior
Caudal
Inferior
SAGITTAL PLANE
Superior
Inferior
TRANSVERSE PLANE (spine)
Rostral
Caudal
HORIZONTAL PLANE

Figure 7.9 The brain can be looked at from different orientations

separates the two hemispheres. This has given rise to the concept of a right and a left brain, with cerebral asymmetries and specialised functions (see Research methods box 7.1). Between the hemispheres are small connections called cerebral commisures; the corpus callosum is the most obvious to the naked eye.

The lateral and central fissures divide the brain into four lobes: the frontal, occipital, temporal and parietal lobes (see Figure 7.10). These areas have been ascribed various functions: the occipital lobe is the area of visual perception; the temporal lobe is the focus of many theories of memory; and the parietal lobe is associated with visuomotor guidance (see Kolb and Whishaw, 2008).

The frontal lobes are considered to form the area that makes us unique as humans. For an account of the frontal lobes see Activity box 7.1. In evolutionary terms the cortex is the most recent addition to the brain and is called the neocortex. However, some have done well without too much cortex! A recent case study of a French civil servant and father of two demonstrates that individuals can compensate for large areas of damage to the brain (although his IQ scores were lower than average). This male had an MRI that 'revealed massive enlargement of the lateral, third, and fourth ventricles, and a very thin cortical mantle' (Feuillet et al., 2007).

Self-test: What are the main regions of the cortex?

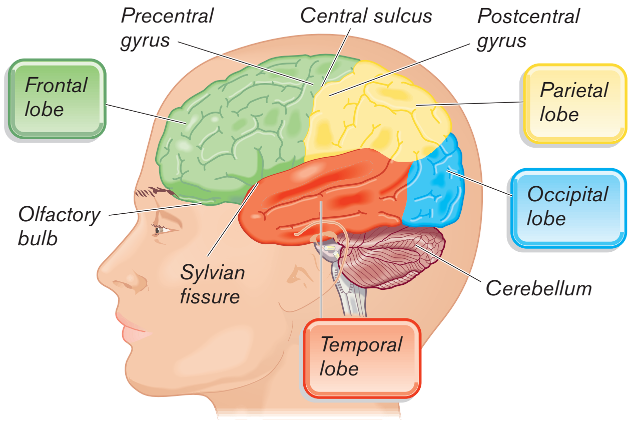

Precentral gyrus
Central sulcus
Postcentral gyrus
Frontal lobe
Parietal lobe
Occipital lobe
Olfactory bulb
Sylvian fissure
Cerebellum
Temporal lobe

Figure 7.10 The frontal lobes

RESEARCH METHODS BOX 7.1

Left brain/right brain

The two cerebral hemispheres have been associated with different functions (see Springer and Deutsch, 1998). Neurological examination indicates that there is a degree of asymmetry between the two sides (see Kolb and Wishaw, 2003). The formation of cerebral lateralisation has taken advantage of both clinical and normal populations.

The notion of functional cerebral asymmetry began when Broca's area was reported. This is an area in the left hemisphere that, when lesioned, produces aphasia. Aphasia is a dysfunction of language comprehension and production. Voluntary motor control was also associated with the left brain, as patients with lesions were apraxic. Apraxia is the inability to perform conscious motor movements. The location of a function in one hemisphere is referred to as lateralisation. The left hemisphere is called the dominant hemisphere.

The dominance of the left hemisphere does not relegate the right hemisphere to a superfluous supporting role. The right hemisphere has been associated with spatial tasks and emotions.

Ascribing a function to a particular hemisphere does not provide it with a precise location. Broca's area is associated with speech production. Another area, Wernike's area, is associated with language comprehension. Both areas produce their own type of aphasia. Geshwind (1970) placed Broca's and Wernike's areas in neural context in the left hemisphere. Basically, incoming language is received by the auditory cortex and sent to Wernike's area for comprehension. If a response is needed a message is sent to Broca's area, which then sends messages to the primary motor cortex. The motor cortex organises the muscles etc. to articulate the response. Visual words are sent to the angular gyrus, which codes the visual information for comprehension in Wernike's area.

This concept of language production and comprehension has been extremely influential, but is rather simplistic. Experimental evidence does not support all the assumptions of Geshwind's model. While the aphasias are evident, the lesions are often widespread, and localisation of function differs across individuals. There are no specifically identified cells for Broca's and Wernike's areas.

An area of hot debate is the difference in cognitive abilities between the sexes (see Weiss *et al*., 2003). Males are regarded as more right brain oriented and more lateralised. Females are thought to be more left brain oriented and to have less lateralisation. The stereotype goes that women are better communicators and males are better at spatial tasks. A car insurance report points to this stereotype. Females are more likely to claim for accidents in car parks while manoeuvring. Males on the other hand have far more serious (and costly) accidents involving high speeds. Thus the myth about women drivers is perpetuated.

Why should there be a difference in lateralisation between the sexes?

Numerous evolutionary theories have been presented. The case for spatial abilities has emphasised the male as hunter-gatherer. Therefore spatial abilities have been selected via natural selection (see Jones et al., 2003).

Is functional lateralisation fixed?

The functional asymmetry of the brain has been investigated during different phases of the menstrual cycle. Sanders and Wenmoth (1998) used a verbal and musical dichotic listening task to reveal the effects of the menstrual cycle on cerebral asymmetries. The verbal task is a task for the left hemisphere, whereas the music task is a task for the right hemisphere.

A brief explanation of the dichotic listening task is required. In the standard dichotic listening task different sequences of digits are simultaneously presented via headphones to each ear. Thus each ear receives a different input. Kimura (1961; 1967) revealed that people recalled more digits from the right ear (left hemisphere) than the left ear.

In the experiment by Sanders and Wenmoth, one dichotic listening task was to identify either consonants or vowels. The other task was to identify which of four musical chords had been presented. The dichotic listening tasks were conducted at different times during the menstrual cycle. The results of this study demonstrated that the women's ability at these tasks differed as a function of menstrual status. During menses, when oestrogen is low, there was a left-ear advantage for the music task (right hemisphere). During the midluteal phase, when oestrogen is high, there was a right-ear advantage for the verbal task (left hemisphere). The functional cerebral asymmetry was greatest for the music task during menses, and for the verbal task during the midluteal phase.

ACTIVITY BOX 7.1

The frontal lobes

The frontal lobes are perhaps the area of the brain that makes us uniquely human. Early studies of frontal lobe function come from research on patients with lesions to this area. The most famous of these was Phineas Gage. He had an accident in which a large area of the frontal lobe was lesioned. Surprisingly he survived. However, there were notable changes in his behaviour.

Similar problems still occur. As I write, the newspapers are covering the story of an American who fell while drilling a hole. The drill went through his skull and brain and out the other side. Lesions of the frontal lobe miss vital areas of the brain involved in life support. Thus people with such lesions survive.

Many researchers have studied the frontal lobe and provided a theoretical framework to understand its function. Luria (1973) pointed out that an individual creates intentions, plans and programmes of his actions. This individual inspects the plans' performance and regulates his behaviour so that it conforms to these plans, and uses feedback to correct mistakes. Norman and Shallice (1980) presented a cognitive science theory to account for the experimental data derived from experimental evidence. They claim the frontal lobes are important in:

- planning and decision-making
- error correction and troubleshooting
- novel situations
- dangerous situations
- overcoming habitual responses and temptation.

The types of problems a patient with frontal lobe damage may have are:

- a failure to see problems as a whole, instead dealing only with fragments of information
- a failure to use error to correct mistakes
- a failure to plan a solution to a problem
- perseveration where new rules are not learned
- poor performance of the Stroop task (see Chapter 13)
- easily distracted
- a failure to inhibit responses.

Now that you have this information, think what is required in an examination. How are the frontal lobes implicated? What might you expect to see if the frontal lobes are damaged?

The examination and the questions make up a novel situation, which requires the candidate:

- to follow instructions – a failure to read them may lead to insufficient questions being answered or too many being answered; this may be seen as a failure to inhibit responses
- to read the question and see how the words relate to each other – if the frontal lobes are damaged they may just pick key words in the question and write about them; the question will require them to apply their knowledge and not just write everything they know about a given subject
- to plan the answer – a failure in planning may result in a disjointed answer that does not focus on the question
- to evaluate the plan – the plan will need to be checked as the answer progresses; in an examination situation it is easy to drift off-task
- not to perseverate – many students use last year's exam as a revision aid; this is good practice; however, do not become dependent on that one question – a new question will appear in the year that you sit your examination; do not perseverate with last year's solution
- to sustain attention and not be distracted – without the role of the frontal lobe the person crunching mints next to you may result in a sorry end to the paper.

Of course, you need more than just the frontal lobes for an exam – the temporal lobe and hippocampus are also useful. You also need to remember the material and how to navigate your way to the exam hall!

The limbic system (and hippocampus)

The limbic system is a network of nuclei that are thought to be involved in emotions and learning. The limbic system comprises the hippocampus, amygdala, cingulate cortex, fornix, septum and mamillary bodies (see Figure 7.11).

The hippocampus and the amygdala have been studied extensively. The hippocampus is associated with spatial memory (see Research methods box 7.2), and the amygdala with fear and emotion (LeDoux, 2000).

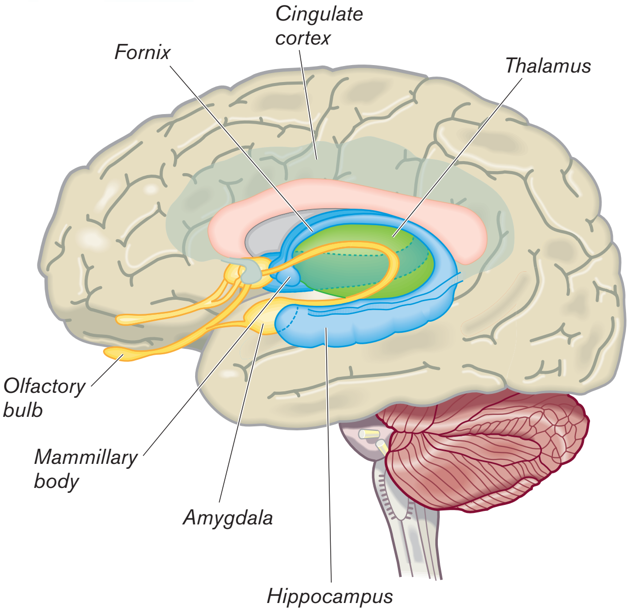


Figure 7.11 The limbic system

RESEARCH METHODS BOX 7.2

The hippocampus and taxi drivers

London taxi drivers have to pass 'the knowledge' before they are licensed. The knowledge consists of knowing many routes around London (e.g. from Buckingham Palace to Harrods).

Maguire et al. (1997) tested taxi drivers' knowledge while undergoing positron emission tomography (PET). A PET scan measures radioactivity. If you make oxygen radioactive you can find out which parts of the brain are using the most.

The taxi drivers were given three tasks:

1. to provide the route between two locations (spatial task)
2. to describe landmarks which weren't in London and which they had not visited (non-spatial task)
3. to recall the plot of a film (control task).

A number of brain regions were activated during these tasks, but the one that differentiated was the hippocampus. The hippocampus was activated only in the spatial task.

Further investigation by Maguire et al. (2000), using MRI scans, indicated that the posterior hippocampus was larger in taxi drivers. Interestingly, the increase in the size of the posterior hippocampus was a function of years as a taxi driver. Therefore, it is unlikely that taxi drivers are born with an increased posterior hippocampus. The increase in the posterior hippocampus occurs through learning and experience.

'We asked him how to get from north London to south London and there was no hippocampal activity'

The basal ganglia
In some neuroanatomical classifications, the basal ganglia also contain the amygdala. The basal ganglia comprise the striatum, the globus pallidus and the substantia nigra. The striatum is further subdivided into caudate and putamen. The globus pallidus has an internal and external part. The substantia nigra divides into two areas called the pars compacta and pars reticulata. The basal ganglia are extremely important in motor control and it is this area that contains the underlying fault in Parkinson's disease and Huntington's disease.

Midbrain: mesencephalon

The mesencephalon is divided into two: the tectum and tegmentum. Again, this division is on the basis of location; the tectum is dorsal and tegmentum is ventral. The tectum comprises the inferior and superior colliculi. These relate to auditory and visual functions respectively. The tegmentum comprises the substantia nigra (also part of the basal ganglia) and another motor area called the red nucleus. The mesencephalon also contains the periaqueductal grey, which is tissue around the cerebral aqueduct that connects the third and fourth ventricle. This site is the target of many analgesics. It also contains the reticular formation, which has been implicated in sleep (see Chapter 11).

Hindbrain: metencephalon and myelencephalon

The metencephalon comprises the pons and the cerebellum (see Figure 7.12). The pons contains a part of the reticular

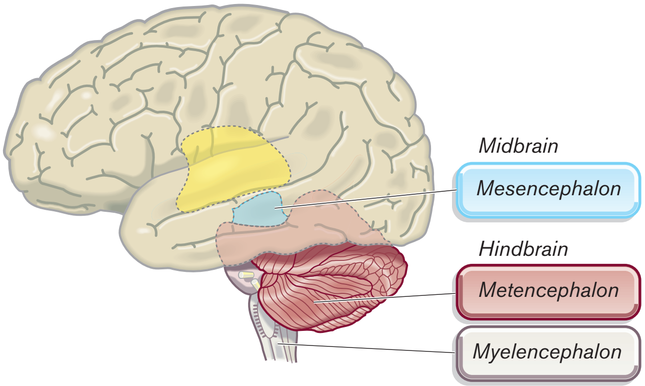


Figure 7.12 The midbrain and hindbrain

formation and descending and ascending neural fibres. The cerebellum is the cauliflower-like structure you can see in MRI images and is involved in motor control.

The myelencephalon (also called the medulla) contains the reticular formation.

Self-test: The basal ganglia comprises of several nuclei. What are they?

Communication in the brain

Neurons do not sit in isolation. They communicate with each other. A neuron receives a message from another at the dendrites and passes it down the axon to the terminal region. The communication of information within a neuron is electrical. The communication between neurons is in general chemically mediated.

Electrical communication

The basis of electrical communication is the difference in ionic concentrations on either side of the neuron's cell membrane. There are different ions in the intracellular and extracellular fluid. Ions are molecules that have different electrical charges. They can be either positively charged (cations) or negatively charged (anions). There is an electrical force between ions: like charges repel and opposite charges attract. Across the membrane this force, or electrostatic pressure as it is known, is in action.

Another force that acts on ions is their movement down the concentration gradient. This is when ions move from where there is a high concentration to where concentration is low, until there is an even distribution. This is somewhat similar to the action of sugar in tea. If you place a spoon of sugar in a cup of tea, there is an initial high concentration of sugar at the bottom. Give the tea a stir and the sugar dissolves and distributes itself evenly throughout the tea.

Resting potential

If we place one electrode inside the neuron and another outside we can measure the difference in electrical charge between the two sides. The resting potential is a comparison of charges from the extracellular fluid to the intracellular fluid. The difference is called a membrane potential; the membrane produces resistance. When there are no influences impinging on the neuron it is said to be at rest, thus the 'resting potential'. The resting potential in neurons is about −70m V.

There are four main ions that contribute to the resting potential: sodium (Na$^+$), potassium (K$^+$), chloride (Cl$^-$) and some negatively charged proteins. Calcium (Ca^{++}) is also involved, but more so at the synapse. These ions are not equally distributed across the cell membrane (see Figure 7.13). There are two reasons for this uneven distribution. The first is that the membrane is semi-permeable and permits certain molecules to pass through it. The site at which an ion can gain passage to either side is called the ion channel. The ion channels are proteins that are configured to allow only certain ions through. The second mechanism responsible for this distribution is the sodium–potassium pump. The sodium–potassium pump is an energy-consuming mechanism, which pumps Na$^+$ out and K$^+$ in. It does this in a three-for-two manner: three Na$^+$ ions for two K$^+$ ions. The sodium–potassium pump is there to counteract the seepage of Na$^+$ into the cell via the semi-permeable membrane. Na$^+$ attempts to gain entry because of the concentration gradient and electrostatic pressure.

Due to the differences at rest, the neuron is polarised – that is, the two sides of the neuronal membrane are differentially charged.

Self-test: Name the ions that are involved in the resting potential.

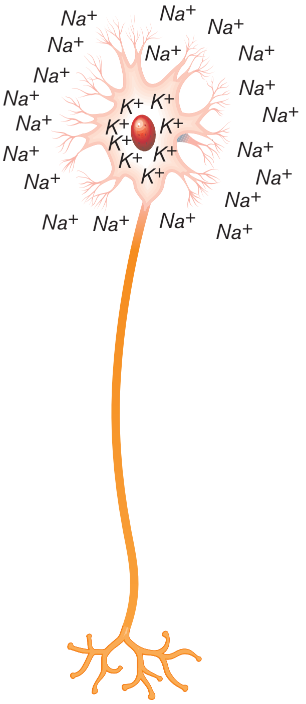


Figure 7.13 The ions across the cell membrane are distributed unevenly

Action potential

When a neuron is activated (or fires) it produces an action potential. Action potentials are the neural impulses that are involved in communication. An action potential is a rapid reversal of the membrane potential. The change in membrane potential permits an exchange of ions. During the resting potential the neuron is polarised; an action potential reduces the polarity and is depolarising. An action potential is a depolarisation of the neuron. Conversely, hyperpolarisation is when the neuron becomes even more polarised than when it is at rest.

Postsynaptic potentials

Incoming signals from other neurons are received by receptors on the dendrites and soma. If the message that is received depolarises the receptor it produces an excitatory postsynaptic potential (EPSP). An inhibitory input produces a hyperpolarisation called an inhibitory postsynaptic potential (IPSP). Both types of input vary according to the intensity of the signal received. An EPSP increases the probability that an action potential will occur and an IPSP decreases that probability.

EPSPs and IPSPs are integrated at the axon hillock. The axon hillock acts like a funnel, collecting all the information before passing it down the axon. Depending on the balance of incoming information (EPSPs and IPSPs) a depolarisation of the axon may occur.

The integration of information at the axon hillock accounts for the location and timing of inputs. In spatial summation there is integration of information coming in from different sites. With temporal summation if the incoming information is close together in time there is an increased change of response in a particular direction. In the case of a barrage EPSP, an axon potential will be initiated.

The sequence of events during an action potential

In the case of an action potential, there is a depolarisation caused by an EPSP. An action potential can be induced artificially with electrodes. If an electrical stimulus is of sufficient strength it reaches the threshold of excitation. The threshold of excitation is the point at which an action potential can occur. The action potential is an all-or-nothing event. Action potentials either happen or they don't. A big stimulus does not produce a bigger action potential. The action potential is always the same size.

The process of an action potential starts with the opening of Na^+ channels. When the channels open, Na^+ enters the cell causing a change in membrane potential. In response, K^+ channels open and K^+ exits the cell. Na^+ channels close, but K^+ ions are still exiting, producing a repolarisation of the cell. K^+ channels close slowly and an overshoot occurs, which results in a hyperpolarisation. Once all channels are closed the membrane returns to the resting potential (see Figure 7.14). All this happens in the space of 3–4 ms.

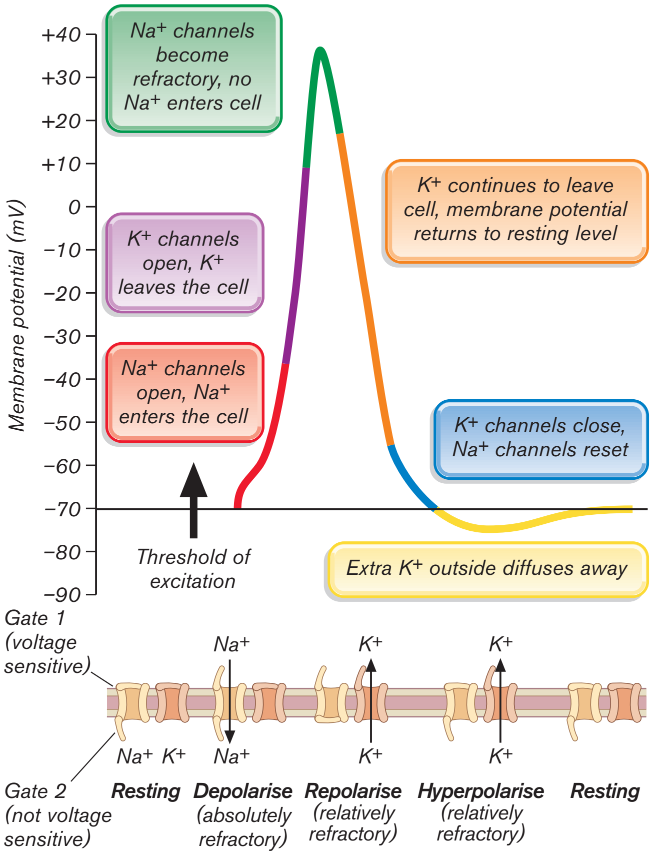
After the start of an action potential there is a period of time in which another one cannot occur. There are two preventative periods of an action potential. There is the absolute refractory period, which is followed by the relative refractory period. The latter requires greater stimulation to obtain an action potential. Thus if a stimulus is of sufficient intensity it will produce an action potential during the relative refractory period.

Self-test: Describe the action potential.

Propagation of the action potential

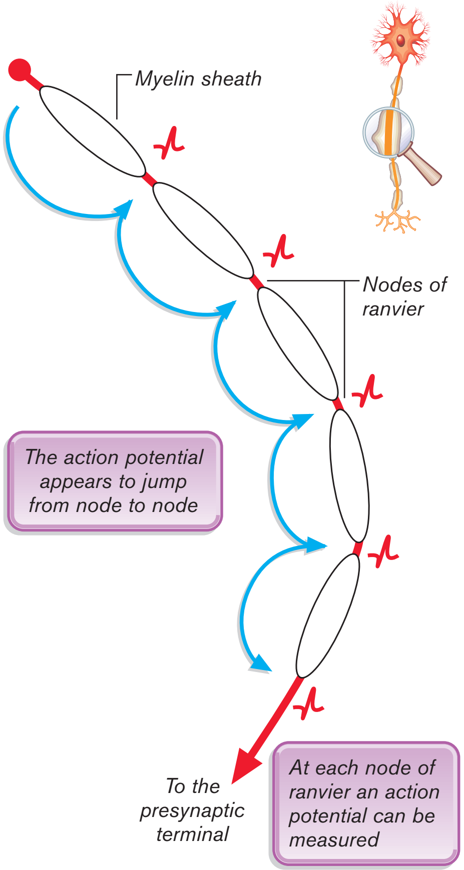
From the axon hillock the action potential moves down the axon. The exchange of ions at one point influences the neighbouring section of the axon. To clarify this concept think of the axon as a set of dominoes laid out ready to topple over. If you are the electrical stimulus and knock over one domino, the next one falls over too. Eventually, all the dominoes fall without your having to touch each one. Each domino falling represents the sequence of events during action potential: one point on the axon influences the other.

The speed of propagation depends on the size of axon; large axons are faster than smaller ones. The speed is increased in myelinated neurons. Myelin acts as insulation (or a sheath) and prevents the ionic exchange characteristic of an action potential. The signal produced by the action



+40
+30
+20
+10
0
−10
−20
−30
−40
−50
−60
−70
−80
−90
Membrane potential (mV)
Na^+ channels become refractory, no Na^+ enters cell
K^+ channels open, K^+ leaves the cell
Na^+ channels open, Na^+ enters the cell
Threshold of excitation
K^+ continues to leave cell, membrane potential returns to resting level
K^+ channels close, Na^+ channels reset
Extra K^+ outside diffuses away
Gate 1 (voltage sensitive)
Na^+
K^+
K^+
Na^+ K^+
Na^+
K^+
K^+
Gate 2 (not voltage sensitive)
Resting
Depolarise (absolutely refractory)
Repolarise (relatively refractory)
Hyperpolarise (relatively refractory)
Resting

Figure 7.14 The action potential: the exchange of ions across the cell membrane can be placed on the recording of an action potential



The action potential appears to jump from node to node

At each node of ranvier an action potential can be measured

Figure 7.15 The effects of myelin on the action potential

potential passes along the sheathed area passively. The impulse along the myelinated axon is diminished. However, in the myelin sheath there are gaps, as we saw earlier, called the nodes of ranvier.

The diminished signal is sufficient for an action potential to occur at these gaps. Thus the action potential appears to jump from node to node in a process called salutatory conduction (see Figure 7.15). Myleinated neurons send information at great speed. The importance of myelin can be seen in patients with multiple sclerosis (MS). In MS the neurons are there but an immune response attacks and destroys the myelin (see Steinman et al., 2002). This has profound effects on sufferers, who experience motor and sensory difficulties.

Self-test: What is myelin and what does it do?

Synaptic transmission

Neurons communicate with other neurons – they send messages to one another. Neurons are not physically connected, though. Between neurons there is a small gap. This gap is called the synapse. For a neuron to communicate with another neuron the synapse has to be traversed. In most cases chemicals, in the process called synaptic transmission, cross the gap, but in a minority of cases it can occur by allowing the current to passively pass through closely aligned ion channels in an electrical synapse (see Figure 7.16).

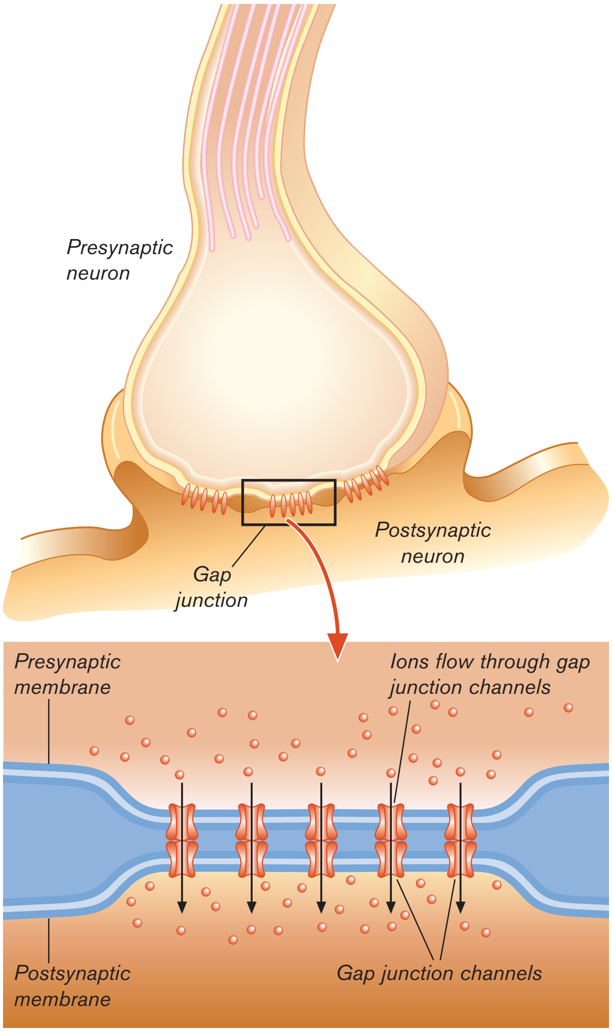
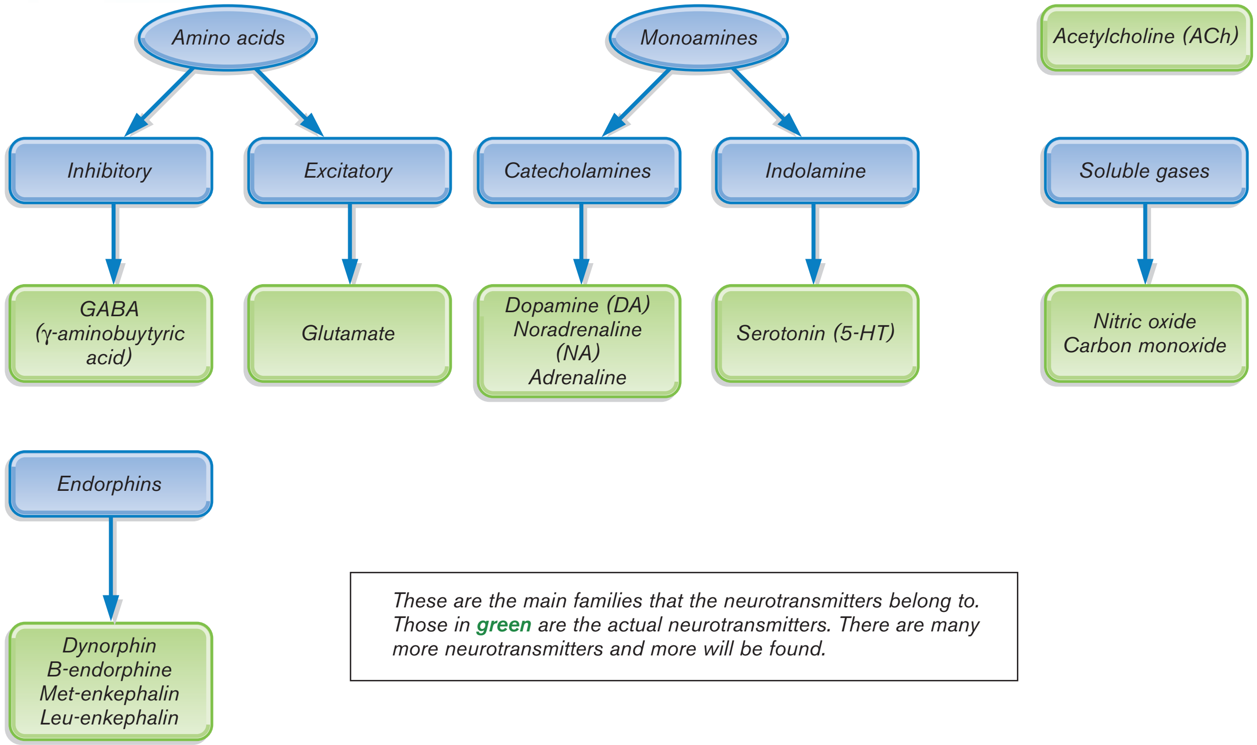


Figure 7.16 An electrical synapse

Self-test: How do neurons communicate with one another?

During synaptic transmission the presynaptic neuron (the neuron sending the message) releases a chemical called a neurotransmitter, which crosses the synapse. Neurotransmitters interact with receptors on another neuron (the postsynaptic neuron). The neuron that receives the message transforms the message into an action potential. The action potential travels down to the axon and releases a neurotransmitter into another synapse.

Consider this like a telephone conversation with someone. The axon is the wire between the two telephones. To be able to talk to someone we have to speak into the handset. The person speaking has to bridge the gap



These are the main families that the neurotransmitters belong to. Those in ***green*** *are the actual neurotransmitters. There are many more neurotransmitters and more will be found.*

Figure 7.17 Neurotransmitters can be categorised into various groups

between mouth and microphone (the synapse). The microphone converts the words into electrical signals. The electrical signals pass down the wire (the axon) to another telephone. The telephone then converts the electrical information (the action potential) into words via the speaker. The speaker sends information across the space that lies between it and the recipient's ear (another synapse). Of course, in this example we are only speaking in one language. We will come back to the example of conversations when we look at chemical communication between neurons in more detail.

Neurotransmitters

There are many neurotransmitters within the nervous system and, with advances in biochemistry, the list of chemicals that act as neurotransmitters is sure to grow.

The neurotransmitters already identified have received extensive investigation. Research has provided detailed accounts of neurotransmission in general and the application of this knowledge to various disorders. Many neurotransmitters are classified into groups or families (see Figure 7.17). Which group a neurotransmitter belongs in depends on its chemical structure.

It is worth noting that for adrenaline and noradrenaline there are differences across the literature. In the USA, adrenaline is referred to as epinephrine and noradrenaline as norepinephrine. Noradrenaline and norepinephrine are one and the same thing – they are no differences (adrenaline and epinephrine are also the same). Also, the chemical name for serotonin is 5-hydroxytryptophan. Serotonin is clearly easier to say, but when reading the literature the abbreviation 5-HT is used.

Neurotransmitters are made – they do not just appear. They have to be synthesised (see Figure 7.19). Synthesis of a neurotransmitter is like a recipe; all the ingredients must be added before the dish is ready. The synthesis of a neurotransmitter takes place in the soma. The newly made neurotransmitter is put into packages called vesicles. The vesicles are transported down microtubules to the presynaptic terminal. They stay there until they are released into the synapse.

Self-test: What neurotransmitters are monoamines?

Synaptic transmission: the events

The vesicles that contain neurotransmitter substances are poised ready for communication. It is the action potential at the presynaptic terminal that causes the neurotransmitter to be released. When the action potential reaches the presynaptic terminal the membrane is depolarised. Depolarisation of the membrane allows calcium (Ca^{++}) ion channels to open and $Ca^{++}$to enter the presynaptic terminal. The entry of Ca^{++} in the presynaptic terminal makes the vesicles fuse with the presynaptic membrane. Once fused, the contents of the vesicle are released into the synapse (see Figure 7.18).

Particular neurons release particular neurotransmitters. A neuron that releases dopamine (DA) is referred to as a

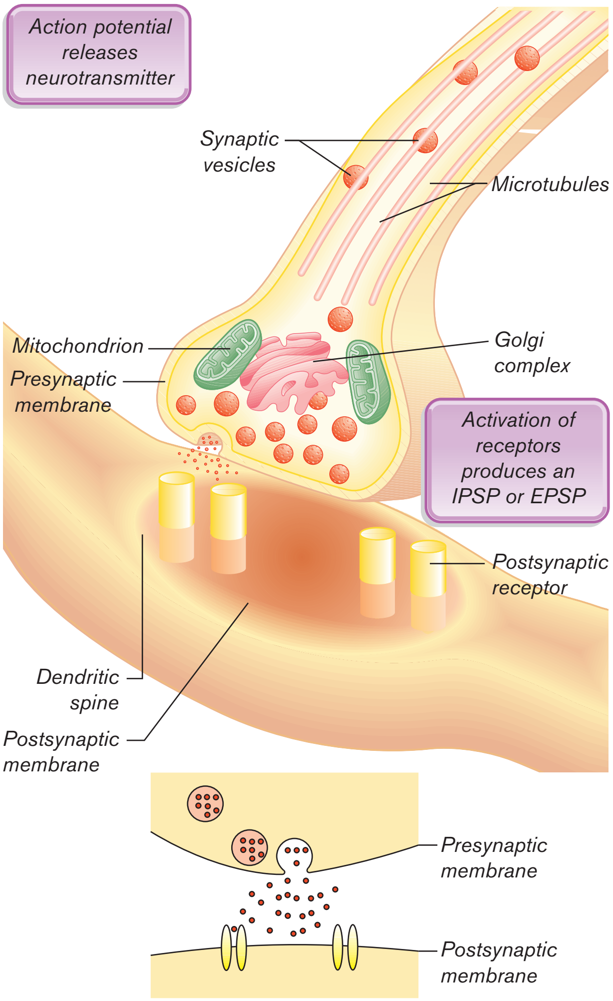


Figure 7.18 The synapse and exocytosis: neurotransmitter release

dopaminergic neuron. Neurons that release glutamate are glutamatergic neurons. This convention can be applied to many neurotransmitters. To use the example of a telephone conversation again, each neurotransmitter can be considered a particular language. A dopaminergic neuron speaks the language of DA, etc. Thus the different neurotransmitters of the nervous system can be considered as the different languages of our world. An example of excitatory and inhibitory messages is given in Activity box 7.2.

Now that the neurotransmitter is in the synapse, its job is to communicate with the postsynaptic neuron (the neuron at the other side of the gap). The postsynaptic neuron requires a means of receiving the message.

In order to receive the message the postsynaptic membrane of the neuron has specialised receptors. These are proteins that are configured so that only certain neurotransmitters can talk to certain receptors e.g. 5-HT with 5-HT receptors (see Table 7.1).

Similarly, if we are to understand a message on the telephone we have to be able to interpret the language being spoken. Our ears are like the receptors for neurotransmitters. We need our ears to hear the other person on the telephone. However, if that person speaks a language we do not understand, the message cannot be conveyed to us. People who understand only English can act only on a message given them in English. They cannot interpret a message in German, for example. However, neurons can be multilingual and can understand other languages (e.g. some DA neurons can understand a message sent by acetylcholine (ACh)).

Self-test: How is serotonin made?

ACTIVITY BOX 7.2

Inhibitory and excitatory pathways in Parkinson's disease

Parkinson's disease is a severe motor disorder caused by a reduction of DA in basal ganglia (Ehringer and Hornykiewicz, 1960). Specifically there is an 80–90 per cent reduction of DA in the substantia nigra and striatum (Bernheimer et al., 1973), which form the nigrostriatal pathway.

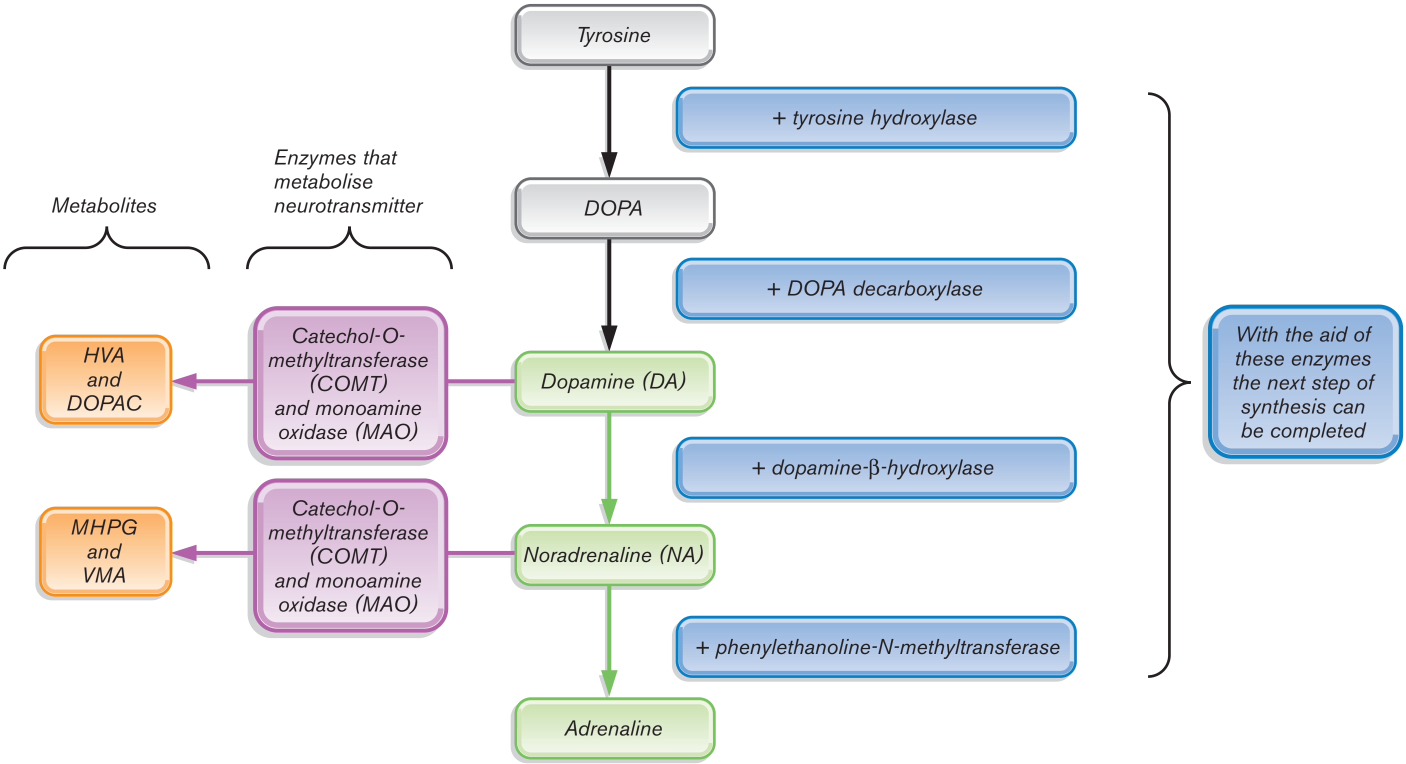
That all seems very simple for a severe neurological disorder. However, a loss of DA in the nigrostriatal pathway has knock-on effects in other areas of the brain. These knock-on effects are mediated by two amino acid neurotransmitters. GABA is an inhibitory transmitter and glutamate is excitatory. Think of them as instructions. GABA is saying 'be quiet', whereas glutamate wants to make some noise.

Figure 7.20a shows the communication in the non-Parkinsonian brain, while Figure 7.20b shows what happens in the brain of someone with Parkinson's disease. Looking at the first flow diagram (Figure 7.20a) the basal ganglia is in harmony because there is no loss of nigrostriatal DA. In the second flow diagram (Figure 7.20b) the loss of nigrostriatal DA has profound effects and produces the symptoms of Parkinson's disease.

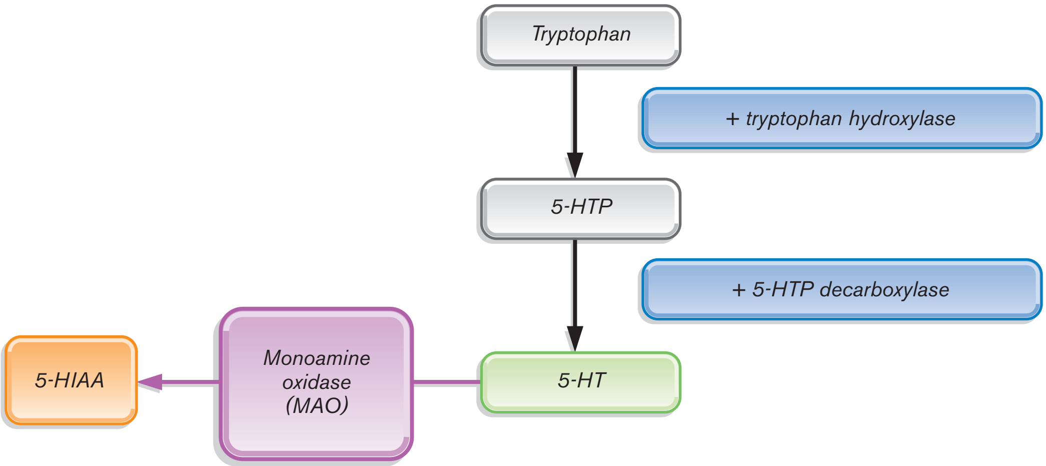
The DA deficiency fails to inhibit the subthalamic nucleus (STN) because not enough GABA is received from the globus pallidus external section. This is called disinhibition. A lack of STN inhibition means that it sends excitatory glutamate messages to the globus pallidus internal (GPi) section. The GPi is then overactive and sends its inhibitory GABAergic message to the thalamus. That thalamus is in effect told to be quiet by the GABA and therefore does not 'talk to' the cortex.

From this example it can be seen how both excitatory and inhibitory neurotransmitters affect groups of cells. Due to one deficiency the effects are seen throughout the motor system.

Dopamine, noradrenaline and adrenaline synthesis and metabolism


Tyrosine
+ tyrosine hydroxylase
Enzymes that metabolise neurotransmitter
Metabolites
DOPA
+ DOPA decarboxylase
HVA and DOPAC
Catechol-O-methyltransferase (COMT) and monoamine oxidase (MAO)
Dopamine (DA)
With the aid of these enzymes the next step of synthesis can be completed
+ dopamine-β-hydroxylase
MHPG and VMA
Catechol-O-methyltransferase (COMT) and monoamine oxidase (MAO)
Noradrenaline (NA)
+ phenylethanoline-N-methyltransferase
Adrenaline

Serotonin synthesis and metabolism


Tryptophan
+ tryptophan hydroxylase
5-HTP
+ 5-HTP decarboxylase
5-HIAA
Monoamine oxidase (MAO)
5-HT

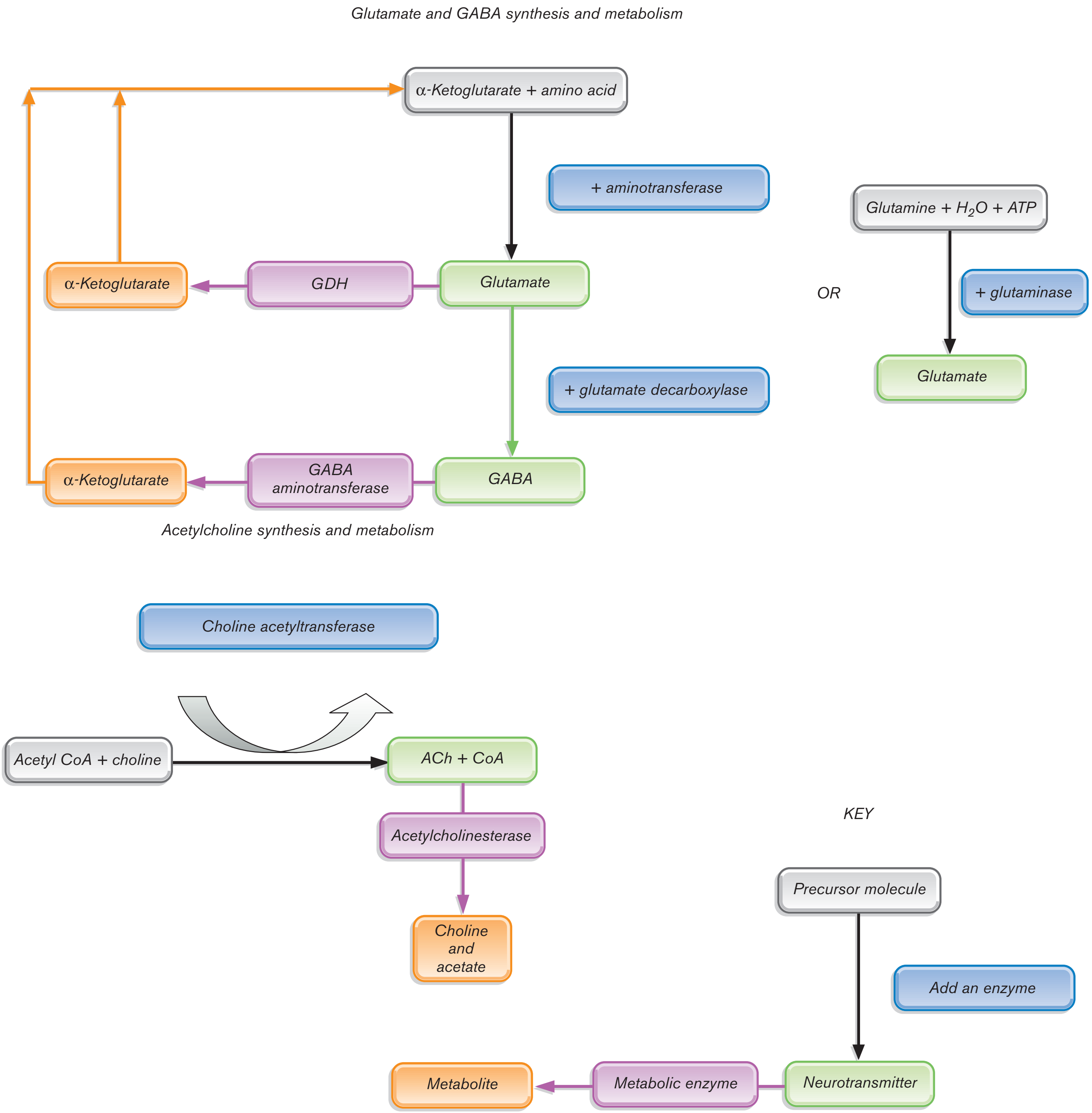
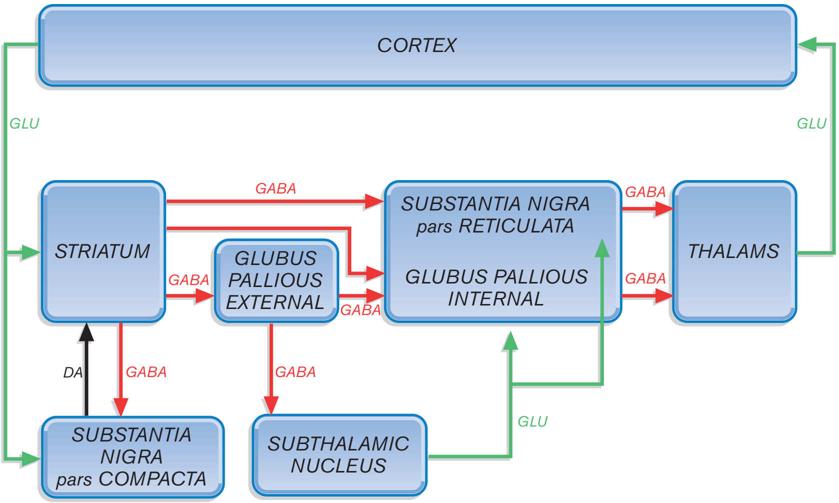

Glutamate and GABA synthesis and metabolism
α-Ketoglutarate + amino acid
+ aminotransferase
Glutamate
GDH
α-Ketoglutarate
+ glutamate decarboxylase
GABA
GABA aminotransferase
α-Ketoglutarate
OR
Glutamine + H2O + ATP
+ glutaminase
Glutamate
Acetylcholine synthesis and metabolism
Choline acetyltransferase
Acetyl CoA + choline
ACh + CoA
Acetylcholinesterase
Choline and acetate
KEY
Precursor molecule
Add an enzyme
Neurotransmitter
Metabolic enzyme
Metabolite

Figure 7.19 The synthesis and metabolism of some key neurotransmitters

(a) *The connections of the basal ganglia*


CORTEX
GLU
GLU
STRIATUM
GABA
SUBSTANTIA NIGRA pars RETICULATA
GLUBUS PALLIOUS INTERNAL
GABA
GABA
THALAMS
GABA
GLUBUS PALLIOUS EXTERNAL
GABA
DA
GABA
GABA
GLU
SUBSTANTIA NIGRA pars COMPACTA
SUBTHALAMIC NUCLEUS

(b) *The connections of the basal ganglia in Parkinson's disease*

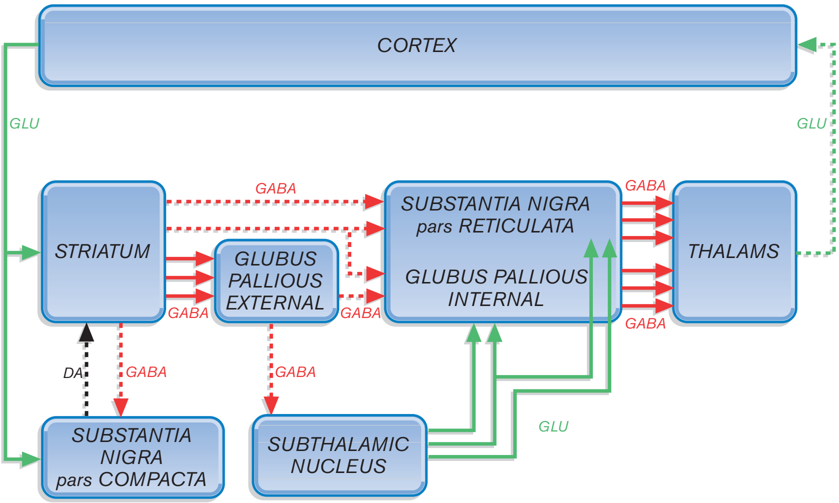

CORTEX
GLU
GLU
STRIATUM
GABA
SUBSTANTIA NIGRA pars RETICULATA
GLUBUS PALLIOUS INTERNAL
GABA
GABA
THALAMS
GABA
GLUBUS PALLIOUS EXTERNAL
GABA
DA
GABA
GABA
GLU
SUBSTANTIA NIGRA pars COMPACTA
SUBTHALAMIC NUCLEUS

Figure 7.20 Communication in (a) the non-Parkinsonian brain and (b) in the brain of someone with Parkinson's disease

TABLE 7.1 NEUROTRANSMITTERS AND RECEPTORS

Dopamine	D1, D2, D3, D4, D5
Noradrenaline	α and β adrenoceptors
Serotonin	5-HT$_1$, 5-HT$_2$, 5-HT$_3$
GABA	GABA A and GABA B
Endorphins	μ, κ, δ
Acetylcholine	Nicotine and muscarinic
Glutamate	NMDA and AMPA

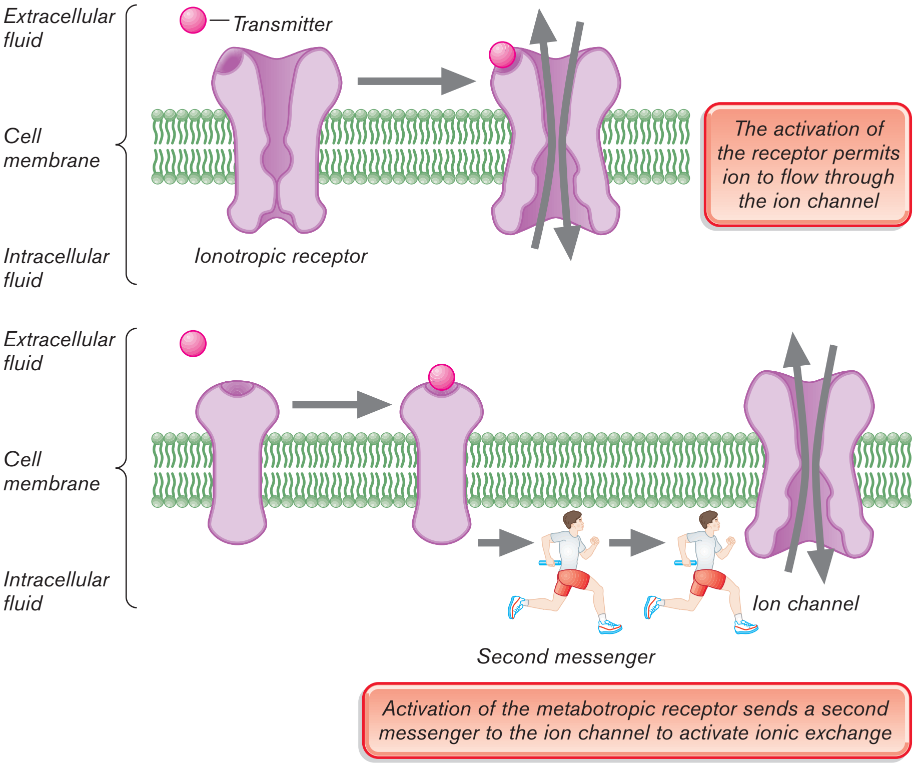

Extracellular fluid
Transmitter
Cell membrane
Intracellular fluid
Ionotropic receptor
The activation of the receptor permits ion to flow through the ion channel
Extracellular fluid
Cell membrane
Intracellular fluid
Ion channel
Second messenger
Activation of the metabotropic receptor sends a second messenger to the ion channel to activate ionic exchange

Figure 7.21 Ionotropic and metabotropic receptors
Source: adapted from Nicholls et al. (2001)

Receptors

When a neurotransmitter attaches itself to a receptor this is called binding. It is not just neurotransmitters that bind to receptors – chemicals bind to receptors too. Chemicals that bind to receptors are called ligands.

There are two types of receptor: ionotropic and metabotropic receptors (see Figure 7.21). These two types of receptor respond to messages in different ways. The ionotropic receptor responds quickly to a neurotransmitter. When a neurotransmitter acts as an ionotropic receptor, ion channels are activated. Ions enter the postsynaptic cell. This induces either an EPSP or IPSP, depending on the ion that enters.

Metabotropic receptors respond to ligands with an intermediate step. The metabotropic receptor activates G-proteins. More often than not, the G-proteins activate another chemical called a second messenger. The second messenger takes the signal to an enzyme that alters ion channel activity. If an ionotropic receptor is a straight race, the metabotropic receptor is a relay race.

Self-test: Describe the difference between an ionotropic and metabotropic receptor.

Synaptic regulation

The released neurotransmitter is monitored by the presynaptic neuron. It does this by using receptors for the neurotransmitter that are located on the presynaptic membrane. These receptors are called autoreceptors (see

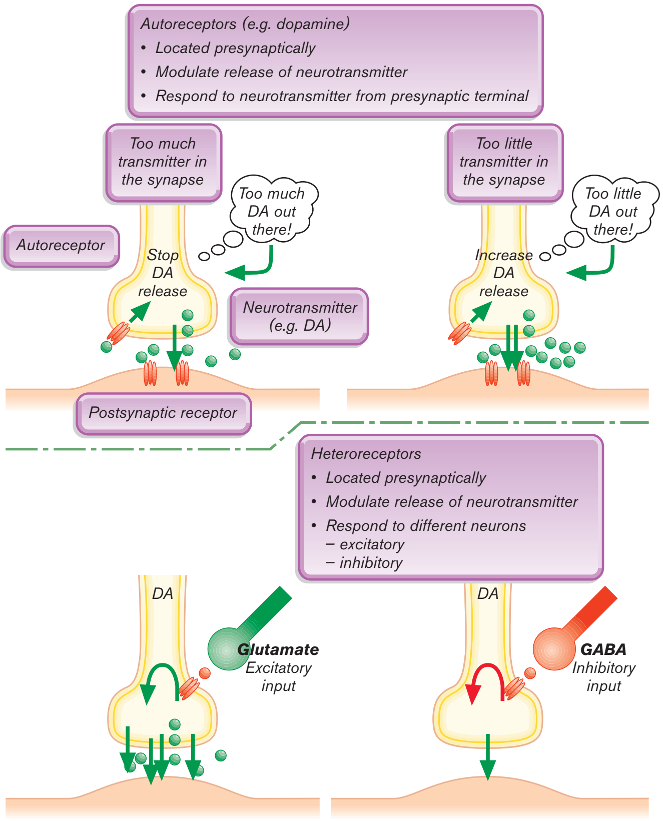

Autoreceptors (e.g. dopamine)
• Located presynaptically
• Modulate release of neurotransmitter
• Respond to neurotransmitter from presynaptic terminal
Too much transmitter in the synapse
Too much DA out there!
Stop DA release
Autoreceptor
Neurotransmitter (e.g. DA)
Postsynaptic receptor
Too little transmitter in the synapse
Too little DA out there!
Increase DA release
Heteroreceptors
• Located presynaptically
• Modulate release of neurotransmitter
• Respond to different neurons
– excitatory
– inhibitory
DA
Glutamate
Excitatory input
DA
GABA
Inhibitory input

Figure 7.22 Presynaptic modulation by autoreceptors and heteroreceptors

Figure 7.22). They act a bit like a thermostat on a central heating system. If you set the thermostat to 18°C and the temperature in the room rises over 18°C, the heating cuts out. Conversely, if it falls below the temperature, the heating comes on.

We can apply this principle to DA. For example, if there is too much DA in the synapse, the autoreceptor relays the message to the neuron and it shuts down the production and release of DA. If there is too little DA, the neuron increases production and release. The neuron therefore uses feedback derived from the autoreceptor to regulate release of the neurotransmitter.

Heteroreceptors are another type of presynaptic receptor, which modulate synaptic transmission. However, they are different from autoreceptors as they receive messages from other neurons. Heteroreceptors on a neuron are responsive to different neurotransmitters. Received signals are either excitatory or inhibitory and can increase or decrease the likelihood of neurotransmitter release (see Figure 7.22). The neuron can understand other neurotransmitters' messages.

Once a neurotransmitter has been released, its life is very short and is brought to an end by either enzymatic metabolism or reuptake. The process of enzymatic degradation involves the conversion of neurotransmitters into other chemicals called metabolites (see Figure 7.18). These metabolites are inactive and can be measured in CSF, urine and blood.

Reuptake also stops the action of a neurotransmitter by reclaiming it from the synapse. The presynaptic neuron can have another set of receptors called transporters. A transporter reclaims the neurotransmitter from the synapse and repackages it for further use.

APPLICATIONS BOX 7.1

The DA hypothesis of schizophrenia: evidence from psychopharmacology

One of the most remarkably resilient hypotheses about the neurochemistry of schizophrenia focuses on DA. It is thought that there is an increase in DA in the schizophrenic brain.

Some of the evidence used to support this hypothesis comes from the actions of drugs. All anti-psychotics block the actions of DA, and DA agonists can increase or induce schizophrenia-like symptoms.

Amphetamine facilitates the release of DA. People who have abused amphetamine can have a form of psychosis that resembles paranoid schizophrenia (Connell, 1958). Amphetamine has been shown to intensify psychotic symptomatology in patients diagnosed with schizophrenia (Van Kammen et al., 1982), but 29 per cent showed an improvement.

Why is amphetamine therapeutic? This is best explained in terms of positive and negative symptoms (Crow, 1980; Sanfilipo et al., 1996). Hallucinations and delusions are examples of positive symptoms. Apathy and an inability to engage in the world and be active typify negative symptoms. Not surprisingly, patients with these symptoms became more animated after a dose of amphetamine. Their baseline activity was so low that there was only room for improvement.

Further evidence of a DAergic involvement in schizophrenia comes from the treatment of schizophrenia. Chlorpromazine was the first drug used to treat schizophrenia. It was also able to block amphetamine-induced behaviours. Chlorpromazine blocked the DA second messenger system, pointing towards the involvement of DA (Miller et al., 1974). Other anti-schizophrenic drugs also increase DA metabolites (an index of DA turnover) due to a compensatory reaction to DA blockade (Carlsson and Lindqvist, 1963).

However, there is a discrepancy between the clinical effects of the pharmacology (Snyder et al., 1975). Haloperidol, another type of anti-schizophrenic drug, did not have a pronounced effect on the DA second messenger system. Kebabian and Calne (1979) proposed two types of DA receptors to account for this difference: the D1 and D2 receptors. The D1 is linked to the second messenger and the D2 is not.

Anti-schizophrenic drugs are regarded as acting at the D2 receptor, where they exert their therapeutic effect. Other drugs act at the D2 receptor and also at the D1 receptor, which blocks the second messenger.

As drug development has continued, new drugs have started to illuminate the neurochemistry of schizophrenia. New types of anti-schizophrenic drugs, called atypical drugs, point to regions in the brain where the therapeutic action takes place. This is a DA-rich area called the mesolimbic system; atypical drugs act there.

The psychopharmacology of schizophrenia is an ongoing concern. As already stated, the involvement of DA was just a hypothesis and remains such. As the decades have passed, the hypothesis has evolved to include other neurotransmitters (e.g. Grace, 1991). Psychopharmacological research has not provided a definitive account of schizophrenia. There are many questions that remain to be answered as to the biological bases of schizophrenia.

Self-test: Describe the effects of an agonist and an antagonist on dopamine autoreceptors.

Retrograde signalling

Until now we have dealt with the presynaptic cell communicating with a postsynaptic cell and *not* a postsynaptic cell communicating with a presynaptic cell. It is now accepted that the latter case is possible (see Alger, 2002). In retrograde signalling, a chemical messenger is released from the postsynaptic cell and interacts with the presynaptic cell. This interaction of the chemical messenger with the presynaptic neuron usually inhibits further release (but not always). Much of the evidence for this has been gained from investigation into the mechanisms of cannabis.

Psychopharmacology

Drugs can influence neurotransmission at many points throughout the entire process of neural communication. We tend to think of drugs as clinical agents; however, we can use drugs as tools to probe the functions of the brain. Drugs can be used to influence physiology and behaviour. Psychopharmacology has helped develop many theories of abnormal behaviour (for example, the DA hypothesis of schizophrenia; see Applications box 7.1)) and has helped inform legislation such as the level of alcohol permitted in drivers. Drug research is not conclusive, however, and can at times raise more questions than it answers.

Drugs classification

Drugs come from different chemical classes and have different pharmacological actions. The best way to categorise drugs is by what they do (e.g. antidepressants treat depression and anxiolytics relieve anxiety). The doctors' prescribing guide, the British National Formulary, is laid out by drug effect. For example, antidepressants come from different chemical classes and have different modes of action, yet are still effective in treating depression (see also Chapter 34).

Drug action

The fate of a drug is determined by two chief characteristics: pharmacokinetics and pharmacodynamics. Pharmacokinetics is about the factors that influence a drug as it travels through the body. Route of administration, rate of absorption and termination of the drug action are important pharmacokinetic factors. Pharmacodynamics is concerned with the drug effect – what happens when it reaches its destination.

Types of drug action

Drugs can be divided into four groups: agonists, antagonists, partial agonists and inverse agonists. Agonists facilitate the action at the synapse. Antagonists (or blockers) inhibit synaptic activity. Partial agonists operate somewhere between a full agonist and a full antagonist. Inverse agonists produce a response that is in the opposite direction to that of an agonist (see Activity box 7.3). Inverse agonists should not be confused with antagonists. Antagonists inhibit a response; they *do not* produce a response. The main two that we will be concerned with here are the agonist and antagonist.

Drugs can also be seen as either competitive or non-competitive (see Figure 7.23). Competitive drugs fight for

ACTIVITY BOX 7.3

Anxiety and the inverse agonists: an adaptation of evolution

Why is it useful to have anxiety?

We all get feelings of anxiety and fear. No doubt you will experience anxiety when you have deadlines to meet or examinations looming. This type of anxiety is normal because of the circumstances.

However, when the anxiety response is maladaptive it may be considered a psychiatric problem.

Drugs such as diazepam (Valium) are used to treat anxiety disorders. Diazepam is a benzodiazepine (BZ) and acts at the BZ receptor. Diazepam is an agonist that boosts the actions of inhibitory GABA at the GABA A receptor. Drugs such as diazepam are called anxiolytics because they reduce feelings of anxiety.

What is the evolutionary significance of anxiety?

Is there a case for an endogenous BZ?

De Blas et al. (1987) found endogenous compounds that bind to BZ receptors that had a similar structure to benzodiazepines. In the search for endogenous BZs, beta-carbolines were discovered. They were found to displace benzodiazepines and to have a wide spectrum of pharmacological activity. Some were found to be inverse agonists.

If the BZs are agonists, then what do inverse agonists do?

Inverse agonists act at the BZ site to reduce the action of the GABA A receptor. Inverse agonists are anxiogenic, pro-convulsant, activating and promnestic (the opposite to amnesic). It is the inverse agonists that may well be the endogenous ligand. Clearly a substance that promoted flight or fight responses would be of evolutionary significance

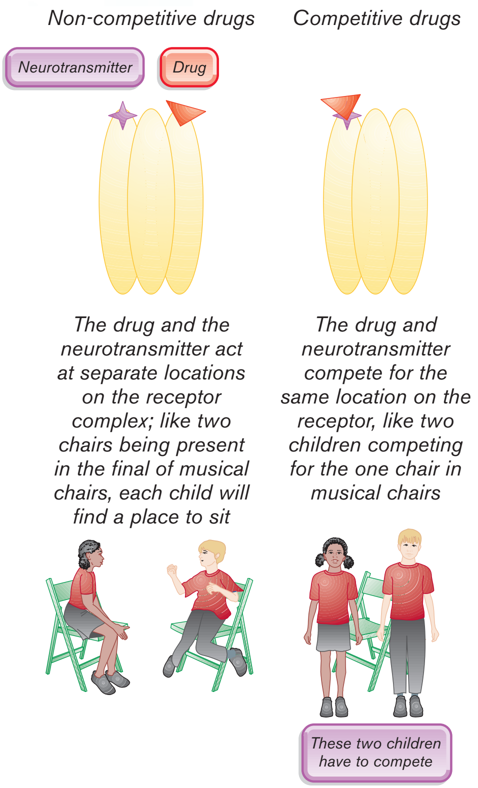

Non-competitive drugs
Competitive drugs
Neurotransmitter
Drug
The drug and the neurotransmitter act at separate locations on the receptor complex; like two chairs being present in the final of musical chairs, each child will find a place to sit
The drug and neurotransmitter compete for the same location on the receptor, like two children competing for the one chair in musical chairs
These two children have to compete

Figure 7.23 Competitive and non-competitive drug action

the same place as the neurotransmitter. This can be seen as rather like the last two children competing in a game of musical chairs. Non-competitive drugs act at a different site on the receptor to the neurotransmitter. In this case, there is a chair for each child in the final of musical chairs.

Modulation of neurotransmission by drugs

Drugs can influence neurotransmission at a number of different points that can influence behaviour (see Figure 7.24).

Precursor drugs

These drugs enhance the synthesis and increase the turnover of a neurotransmitter by acting as a precursor in the neurotransmitter's synthesis (e.g. L-DOPA therapy in Parkinson's disease provides the precursor for DA where DA is deficient).

Synthesis inhibition

Drugs can interrupt synthesis, thus preventing a neurotransmitter from being made (e.g. αMPT stops the action of tyrosine hydoxylase and therefore DA (and NA) cannot be made).

Storage prevention

Drugs can prevent the neurotransmitter from being stored in the vesicle (e.g. reserpine makes monoamine vesicles 'leaky'). Just as a teabag allows the flavour to flood out into the water, monoamines flood out into the cytoplasm of the cell. Once in the cytoplasm, the monoamines are metabolised. Reserpine was once used as a treatment for schizophrenia, but it has also been used to induce the symptoms of depression in animals.

Enhance neurotransmitter release

Drugs can promote neurotransmitter release from presynaptic terminals (e.g. amphetamine forces the release of DA (and NA) without an action potential). Amphetamine has been reported to induce symptoms similar to paranoid schizophrenia (see Applications box 7.1).

Postsynaptic stimulation

Drugs can act at the postsynaptic receptor and mimic the endogenous neurotransmitters e.g. nicotine acts at a receptor for ACh and is called a nicotinic receptor. This receptor was discovered using nicotine as a tool to locate its site of action. However, nicotine is not an endogenous ligand like ACh; we do not have a receptor specifically designed for smoking.

APPLICATIONS BOX 7.2

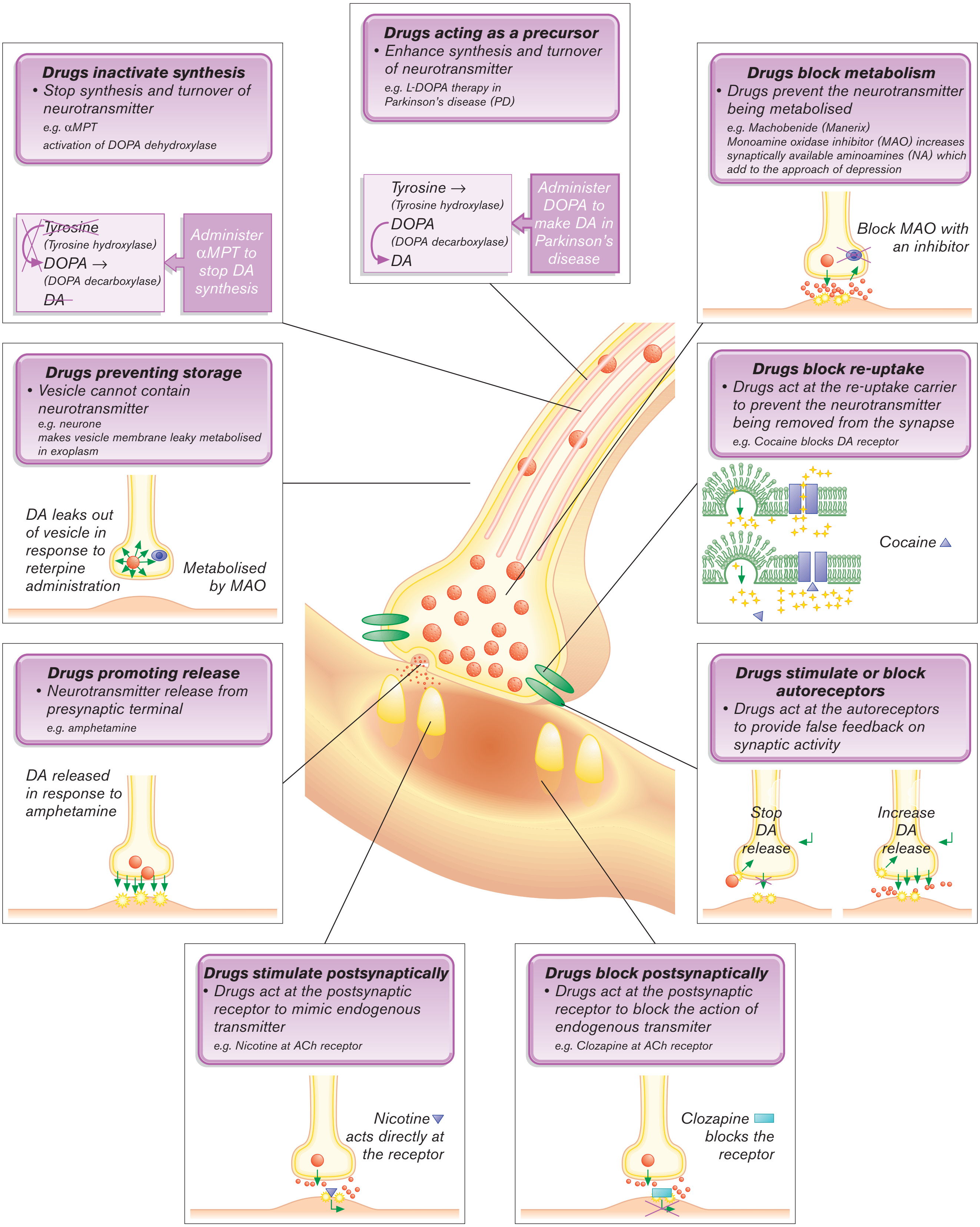
Bioterrorism

As the world becomes an increasingly unstable place to live in, with each warring faction determined to win, it is hard to see how psychobiology could be involved.

However, disputes between groups may not use traditional methods of fighting such as guns and tanks. The use of biological agents is not new in war, but bioterrorism is now regarded as a significant threat.

Nerve agents such as sarin have the effect of preventing acetylcholine esterase from metabolising ACh. If exposed to a nerve agent, then the net effect is an increase in ACh available at the muscarinic and nicotinic receptors. In the CNS, the behavioural effects are irritability, anxiety, impaired cognition and loss of consciousness.

The good news is that there are drugs that can be used to try to negate the effects of nerve agents. The bad news is they need to be delivered quickly to the victim.



Drugs inactivate synthesis
- Stop synthesis and turnover of neurotransmitter

e.g. αMPT
activation of DOPA dehydroxylase

~~Tyrosine~~
(Tyrosine hydroxylase)
DOPA →
(DOPA decarboxylase)
~~DA~~
Administer αMPT to stop DA synthesis

Drugs acting as a precursor
- Enhance synthesis and turnover of neurotransmitter

e.g. L-DOPA therapy in
Parkinson's disease (PD)

Tyrosine →
(Tyrosine hydroxylase)
DOPA
(DOPA decarboxylase)
DA
Administer DOPA to make DA in Parkinson's disease

Drugs block metabolism
- Drugs prevent the neurotransmitter being metabolised

e.g. Machobenide (Manerix)
Monoamine oxidase inhibitor (MAO) increases synaptically available aminoamines (NA) which add to the approach of depression

Block MAO with an inhibitor

Drugs preventing storage
- Vesicle cannot contain neurotransmitter

e.g. neurone
makes vesicle membrane leaky metabolised in exoplasm

DA leaks out of vesicle in response to reterpine administration
Metabolised by MAO

Drugs block re-uptake
- Drugs act at the re-uptake carrier to prevent the neurotransmitter being removed from the synapse

e.g. Cocaine blocks DA receptor

Drugs promoting release
- Neurotransmitter release from presynaptic terminal

e.g. amphetamine

DA released in response to amphetamine

Drugs stimulate or block autoreceptors
- Drugs act at the autoreceptors to provide false feedback on synaptic activity

Stop DA release
Increase DA release

Drugs stimulate postsynaptically
- Drugs act at the postsynaptic receptor to mimic endogenous transmitter

e.g. Nicotine at ACh receptor

Nicotine ▽ acts directly at the receptor

Drugs block postsynaptically
- Drugs act at the postsynaptic receptor to block the action of endogenous transmiter

e.g. Clozapine at ACh receptor

Clozapine ▭ blocks the receptor

Figure 7.24 Drugs can influence neurotransmission in a number of ways

Postsynaptic antagonism
A drug can act at the postsynaptic receptor to block the action of endogenous neurotransmitters (an antagonist) (e.g. the antipsychotic haloperidol blocks DA D2 receptors and thus stops DA interacting with these receptors).

Autoreceptor stimulation and antagonism
Drugs can act at the autoreceptor to provide false feedback on synaptic activity (e.g. apomorphine at low doses stimulates the DA autoreceptor to reduce the release of DA). Conversely, the DA antagonist haloperidol increases DA. This would appear counterintuitive as its task is to stop DA activity and reduce the symptoms of schizophrenia (see earlier for haloperidol's therapeutic target).

Drugs that block reuptake
Drugs can act at the reuptake transporter to prevent the neurotransmitter being removed from the synapse (e.g. cocaine and methylphenidate (Ritalin) blocks the DA transporter and thus increases DA in the synapse because it cannot escape and be deactivated). This is also how Prozac works, but specifically at 5-HT transporters, hence it is referred to as a selective serotonin reuptake inhibitor (SSRI).

Inhibition of metabolism
Drugs can prevent the neurotransmitter from being metabolised (e.g. the antidepressant moclobemide is a monoamine oxidase inhibitor (MAOI)). MAOIs increase monoamines in the synapse by inhibiting the enzymes that degrade them. The only drugs available for the treatment of Alzheimer's disease (e.g. donepezil) act in a similar way to block the metabolism of ACh. These anti-dementia drugs are called anticholinesterase inhibitors. (See Applications box 7.2 for a further use of metabolic inhibition.)

Multiple sites of drug action
Drugs often act at more than just one site. This can lead to increased therapeutic efficacy, e.g. the anti-schizophrenic drug clozapine acts on DA, 5-HT and glutamate systems to be clinically effective. Multiple sites may be required for the pharmacotherapy of Alzheimer's disease; because so much goes wrong in the brains of these patients one target is not sufficient.

Multiple sites of action can also contribute to neurotoxicity and adverse effects (e.g. MDMA (see Applications box 7.3). The action of drugs, other than the desired target, can lead to side-effects.

Self-test: In what ways can drugs modify neurotransmission?

APPLICATIONS BOX 7.3

The agony of ecstasy: long-term effects of MDMA

There is controversy surrounding the effects of MDMA (ecstasy) on the brain. MDMA releases DA and 5-HT. The initial release of 5-HT is followed by depletion. The acute behavioural affects of MDMA are well known (e.g. a positive mood) (Downing, 1986). MDMA is self-administered (Lamb and Griffith, 1987), induces a conditioned place preference (Marona-Lewicka et al., 1996), acts as a discriminative stimulus (Baker et al., 1995) and induces locomotor sensitisation (Cheeta and Chandler, 1998).

All of these measures indicate that MDMA is a drug of abuse. However, it is the long-term neurotoxicity of MDMA that gives cause for concern. Ricaurte et al. (1988) demonstrated that MDMA administration results in neurodegeneration of 5-HT terminals. McCann et al. (1998), using PET scans in humans, found a decreased global and regional reduction in 5-HT transporters in the brain.

Reports on the behavioural consequences of MDMA neurotoxicity are starting to appear. Serotonin is implicated in sexual activity, sleep, pain, circadian and seasonal rhythms, affective behaviours, motor activity and body temperature. Studies have demonstrated that MDMA users had lower scores on measures of impulsivity and indirect hostility (McCann et al., 1994), delayed and immediate recall (Parrott et al., 1998) and verbal recall (Thomasius et al., 2003). They also had low mood problems after drug use (Curran and Travill, 1997), which could last up to a year (Taurah and Chandler, 2003). However, changes in depression were not correlated with changes in 5-HT neurons (van den Brink et al., 2003).

There are methodological problems associated with studying the consequences of MDMA use. Most users do not take just MDMA. They are poly-drug users and may take other drugs too, such as ketamine or cannabis. MDMA is illegal, therefore the recruitment of participants is difficult. Those that volunteer may be different in some way from those that do not. The illegal nature of MDMA means that one cannot determine accurate details of drug-taking. People do not know how much of the drug they are taking and what other drugs it may be combined with (e.g. amphetamine). Ethical considerations mean that controlled studies are not permitted in the human population. Of course, this is not unique to MDMA. Research into the effects of other illegal drugs is also limited by such variables.

A conclusive answer accounting for the long-term effects of MDMA is yet to be found. As time passes and MDMA users grow older, its effects may start to become increasingly apparent. These reports allude to a future danger. The high derived from ecstasy now may well give way to depression in later years.

Endocrinology: hormones and their action

Hormones are chemicals that are secreted by endocrine glands (see Figure 7.25). Hormones enter the bloodstream and travel to their destination. The distance a hormone travels can vary from millimetres to metres. Thus hormones, like neurotransmitters, are chemicals that transmit messages.

There are some more similarities between hormones and neurotransmitters:

- both neurons and endocrine glands store their chemicals for release
- both neurons and endocrine glands require stimulation to release their chemicals
- there are many types of hormone; some neurotransmitters also act as hormones
- there are receptors for hormones and these are linked to second messengers.

There are also some differences between hormones and neurotransmitters:

- neurons communicate with adjacent cells; hormones travel throughout the body before they reach their target (see Figure 7.25)
- hormones are slow; neural communication is fast
- the action potential is all or nothing in neurons, whereas hormone levels alter the intensity of the message.

Types of hormone

There are three categories of hormone, distinguished by their chemical structure: protein, amine and steroid hormones. Protein hormones and most amine hormones act at receptors on the cell membrane. The receptors initiate second messengers similar to a metabotropic receptor (see Figure 7.21). The protein hormones influence previously made proteins (see Chapter 6). Steroid hormones gain entry to the inside of a cell and, once inside, the steroid acts as a receptor and binds to the DNA. The steroid hormone influences transcription and the creation of new proteins (see Figure 7.26).

The pituitary and hypothalamus

The pituitary gland and the hypothalamus are considered to be in control of the endocrine system.

The pituitary gland releases tropic hormones that send signals to release other hormones. There are two parts to the pituitary gland: anterior and posterior. The two areas differ in the hormones they release (see Figure 7.27). The pituitary is under the influence of the hypothalamus.

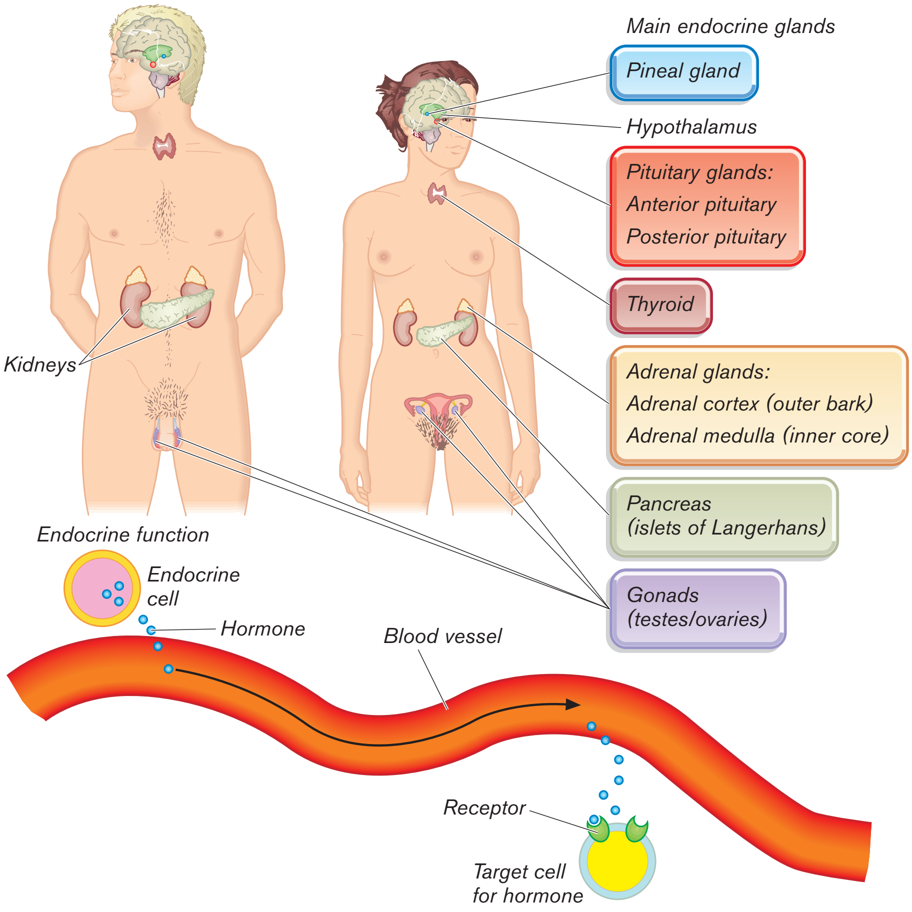

Main endocrine glands
Pineal gland
Hypothalamus
Pituitary glands:
Anterior pituitary
Posterior pituitary
Thyroid
Adrenal glands:
Adrenal cortex (outer bark)
Adrenal medulla (inner core)
Pancreas
(islets of Langerhans)
Gonads
(testes/ovaries)
Kidneys
Endocrine function
Endocrine cell
Hormone
Blood vessel
Receptor
Target cell for hormone

Figure 7.25 Hormones travel to distant targets; the endocrine glands release hormones that travel to their target destination via the bloodstream

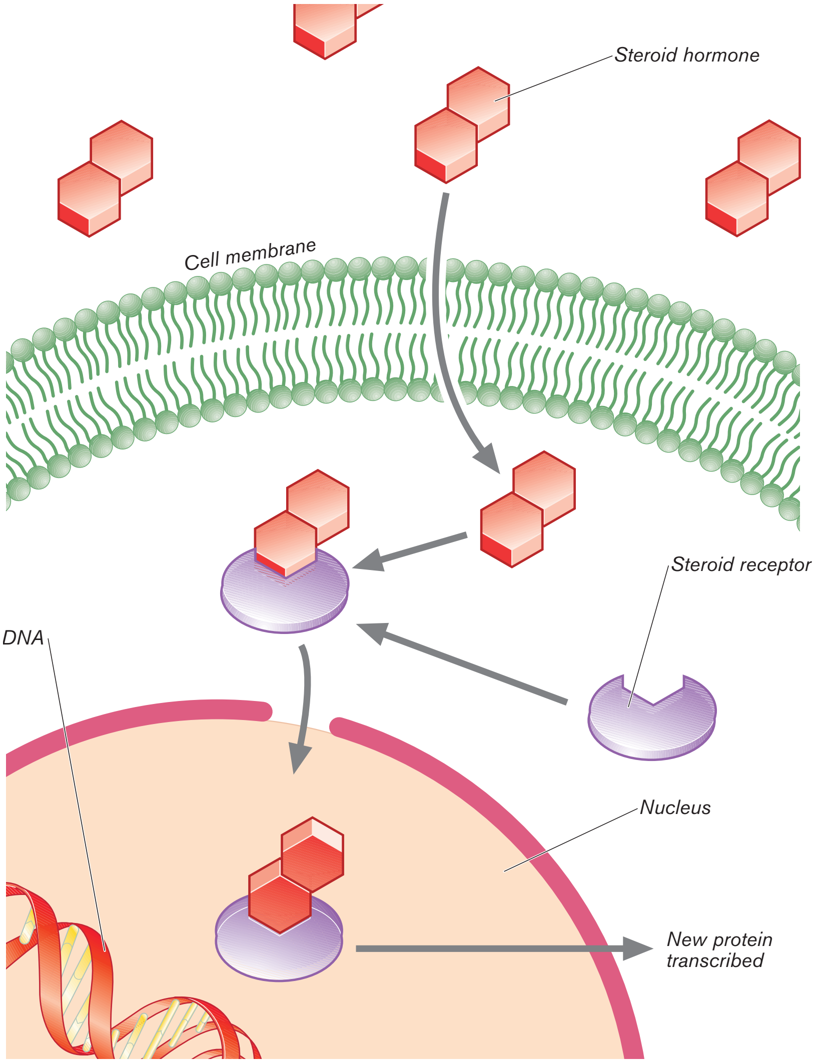


Figure 7.26 Steroid hormones enter the cell to alter the DNA and facilitate the production of new proteins

The hypothalamus communicates with the anterior and posterior pituitary using different mechanisms. The paraventricular and supraoptic nuclei of the hypothalamus have neurons that project down the pituitary stalk to the posterior pituitary. The hormones of the posterior pituitary are transported from the hypothalamus down these neurons. Such neurons are called neurosecretory cells.

The hypothalamus influences the anterior pituitary via networks of capillaries called the hypothalamic-pituitary portal system. The hypothalamus sends out either releasing or inhibiting hormones to the anterior pituitary.

Endocrine feedback

Hormones exert many effects on the body and ultimately on behaviour. Hormones are not released in a constant stream, but rather in pulses. There is a considerable amount of feedback from the environment, which can affect hormone levels and subsequent behaviour.

Sex and hormones

Males and females differ in their hormones, in particular the sex hormones. Hormonal changes in females have been studied extensively. There is a whole area of medicine specifically devoted to the female (gynaecology). The menstrual cycle consists of systematic fluctuations in the hormone levels of females and these naturally occurring changes allow psychologists to identify the effects of hormones on behaviour. For example, Sanders and Wenmoth (1998) were able to identify changes in functional cerebral asymmetry across the menstrual cycle (see Research methods box 7.1). Males do not demonstrate such a cycle.

Self-test: Describe the endocrine system and how it differs from the CNS.

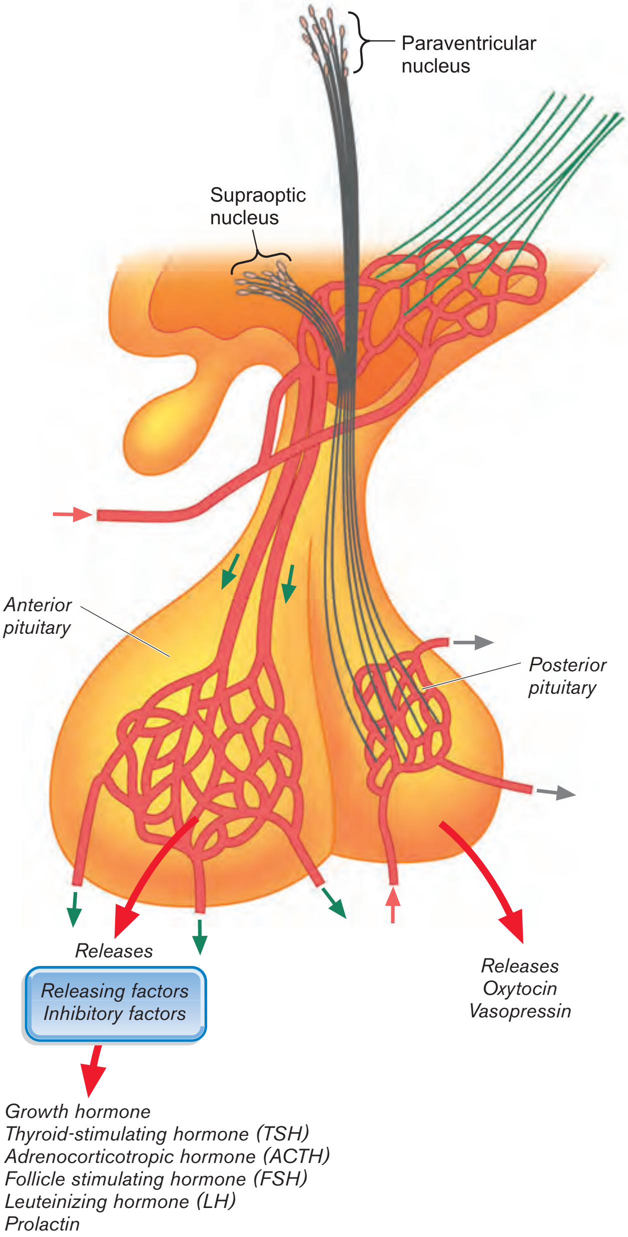

Paraventricular nucleus
Supraoptic nucleus
Anterior pituitary
Posterior pituitary
Releases
Releasing factors
Inhibitory factors
Releases
Oxytocin
Vasopressin
Growth hormone
Thyroid-stimulating hormone (TSH)
Adrenocorticotropic hormone (ACTH)
Follicle stimulating hormone (FSH)
Leuteinizing hormone (LH)
Prolactin

Figure 7.27 The anterior and posterior pituitary glands release different hormones

Activational and organisational effects of hormones

There are two processes by which hormones exert an influence: activational ones when changes in hormone levels influence behaviour and organisational – those that differentiate the body and brain.

Sexual differentiation

For the first few weeks after conception the foetus is undifferentiated; it is neither male nor female. The chromosomes for males are XY and the chromosomes for females are XX, as we have seen. The presence of the Y chromosome codes for the release of H-Y antigen. The presence of H-Y antigen allows the testes to grow. Absence of H-Y antigen allows the ovaries to develop.

After 6 weeks of gestation, the foetus has reproductive ducts. In the male, the reproductive ducts are called the Wolffian system. In the female, they are known as the Mullerian system. These systems are the start of the seminal vesicles and vas deferens in the male and the uterus and fallopian tubes in females.

Once formed, the testes of the male foetus release testosterone and Mullerian-inhibiting factor. Mullerian-inhibiting factor suppresses the development of the female system and allows testosterone to develop the Wolffian system. In the female foetus, the Mullerian system is allowed to develop. Again it is the absence of hormonal influences that allows the female system to develop.

Meanwhile, the external features of sexual differentiation are becoming evident. At about 2 months there is no

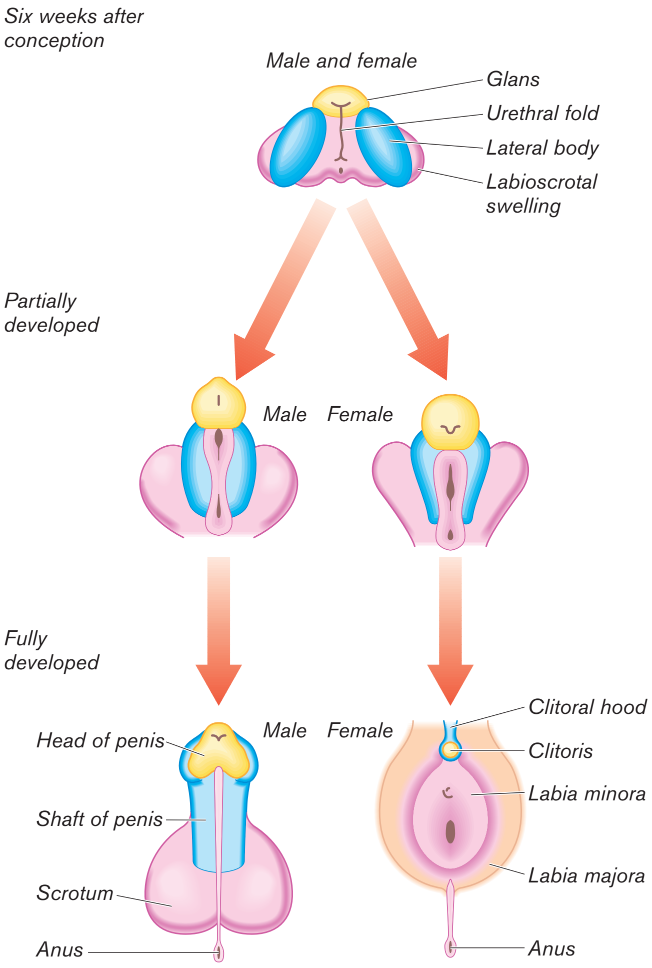

Six weeks after conception
Male and female
Glans
Urethral fold
Lateral body
Labioscrotal swelling
Partially developed
Male
Female
Fully developed
Male
Female
Head of penis
Shaft of penis
Scrotum
Anus
Clitoral hood
Clitoris
Labia minora
Labia majora
Anus

Figure 7.28 The genitals are undifferentiated after conception and then, during gestation, develop into male and female

external difference. The reproductive organs of males and females emanate from four principal components (see Figure 7.28). The development of the male external genitalia is controlled by the presence of testosterone, whereas it is the *absence* of testosterone that allows the female genitals to develop.

Sexual differentiation of the brain

The organisational effects of hormones are not restricted to the reproductive systems of the different sexes. Hormones also affect the brain.

The most obvious line of thought is that the presence of androgens, such as testosterone, alters the male brain. The male brain produces male behaviours; an absence of androgens results in a female brain and, subsequently, female behaviours. This is not the case. The aromatisation hypothesis is at first counterintuitive. The aromatisation hypothesis states that estradiol (a female hormone) is responsible for the masculine brain. Due to the chemical similarities, testosterone can be converted into estradiol (an oestrogen). The female brain is protected from aromatisation by a-fetoprotein, which binds with estradiol and stops its gaining access to the brain. Testosterone, contrariwise, gets into the brain before it is converted into estradiol.

There are areas of the brain that are structurally different in males and females. The preoptic area of the hypothalamus is larger in males than females (Gorski et al., 1978; Raisman and Field, 1971). This nucleus is referred to as the sexually dimorphic nucleus – that is, it differs between the sexes. Similarly, other areas of the hypothalamus are also larger in males (e.g. Swabb and Fliers, 1985). Lesions on the preoptic nucleus in the rat stop male copulatory behaviour (Hull et al., 1999), whereas stimulation elicits it (Rodriguez-Manzo et al., 2000). The role of the hypothalamus is still subject to further investigation. However, the fact that structural differences exist has prompted researchers to look at the brains of people with different sexual orientations (see Rahman and Wilson, 2003). Some studies have indicated that there are differences in the sexually dimorphic nuclei in homosexual and heterosexual men (e.g. LeVay, 1991). This type of research has many social, ethical and moral implications.

Self-test: What is the role of the anterior and posterior pituitary gland in hormone release?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the divisions of the nervous system.
2. Describe the different regions of the brain.
3. Provide an account of neural communication.
4. Describe how drugs influence neural communication.
5. Provide an account of endocrine communication.

Further reading

Andrewes, D. (2001) *Neuropsychology from Theory to Practice*. Hove: Psychology Press.

Feldman, R. S., Meyer, J. S. and Quenzer, L. F. (1997) *Principles of Neuropsychopharmacology*. Sunderland, VT: Sinauer Associates, Inc.

Julien, R. M. (2004) *A Primer of Drug Action: A Nontechnical Guide to the Uses and Side Effects of Psychoactive Drugs*, 10th edn. New York: W. H. Freeman.

Nicholls, J. G., Martin, A. R., Wallace, B. G. and Fuchs, P. A. (2001) *From Neuron to Brain*, 4th edn. Sunderland, VT: Sinauer Associates, Inc.

Rosenzweig, M. R., Breedlove, S. M. and Watson, N. V. (2007) *Biological Psychology*, 5th edn. Sunderland, VT: Sinauer Associates, Inc.

Parrott, A., Morinan, A., Moss, M. and Scholey, A. (2004) *Understanding Drugs and Behaviour*. Chichester: John Wiley & Sons.

Toates, F. (2006) *Biological Psychology*, 2nd edn. Harlow: Prentice-Hall.

Essay titles and references

1 Describe the functions of the cortex. What would your behaviour be like if one part of it were to be damaged?

Andrewes, D. (2001) *Neuropsychology from Theory to Practice*. Hove: Psychology Press.
Carlson, N. R. (2004). *Physiology of Behaviour*, 8th edn. Boston, MA: Allyn & Bacon.
Kolb, B. and Whishaw, I. Q. (2003) *Fundamentals of Human Neuropsychology*, 5th edn. New York: Worth.

2 Describe the process of neural communication.

Feldman, R. S., Meyer, J. S. and Quenzer, L. F. (1997) *Principles of Neuropsychopharmacology*. Sunderland, VT: Sinauer Associates, Inc.
Nicholls, J. G., Martin, A. R., Wallace, B. G. and Fuchs, P. A. (2001) *From Neuron to Brain*, 4th edn. Sunderland, VT: Sinauer Associates, Inc.
Rosenzweig, M. R., Breedlove, S. M. and Watson, N. V. (2007) *Biological Psychology*, 5th edn. Sunderland, VT: Sinauer Associates, Inc.

3 Discuss using appopriate examples how drugs are not just treatments, but tools for scientific investigation.

Feldman, R. S., Meyer, J. S. and Quenzer, L. F. (1997) *Principles of Neuropsychopharmacology*. Sunderland, VT: Sinauer Associates, Inc.
Parrott, A., Morinan, A., Moss, M. and Scholey, A. (2004) *Understanding Drugs and Behaviour*. Chichester: John Wiley & Sons.

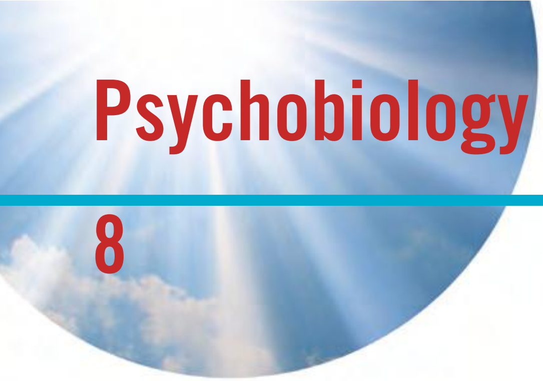
Web links

American College of Neuropsychopharmacology (ACNP): http://www.acnp.org/

British Association for Psychopharmacology: http://www.bap.org.uk/

British Neuroscience Association: http://www.bna.org.uk/

Society for Neuroscience: http://web.sfn.org/



Psychobiology

8

Animal learning and cognition

Route map

In the first two sections of this chapter, we will address the two dominant theories of learning: classical conditioning and operant conditioning. The application of associative learning theories illustrates how experience can influence biological responses. In the third section of this chapter, we will look at cognitive learning. In the final section, the possible underlying neural mechanisms of learning are addressed.

Introduction

It would be easy to assume that biology determines behaviour. In part it does – we are born with the necessary equipment to learn and adapt. This is called preparedness (see Chapter 33, page 479). An organism is not born with a complete set of programmes to deal with every situation it could ever encounter – it has to adapt its behaviour for survival.

An example of this is imprinting (Lorenz, 1937). Imprinting is when a newly born animal attaches itself to a moving object. In the case of Lorenz's ducks, they followed him rather than their mother. These adaptations and experiences shape future behaviour and also physiology. The organism learns from experience.

From an evolutionary perspective, behaviour that favours survival will be selected. Those behaviours that are not useful will not be selected. There are many similarities between the learning theories and evolutionary theories (e.g. adaptation to the environment). The main difference between the two is timescale. Learning is within an organism's lifetime, whereas evolution transcends the life of an individual.

Two notable theorists have dominated the field of animal learning: Pavlov and Skinner. Their initial learning theories have been adapted, refined and supported by empirical study in both animals and humans. The two main theories – classical conditioning and operant conditioning – are referred to as 'associative learning'; this is because associations are made between stimuli and their responses.

Habituation

Habituation is the simplest and most ubiquitous form of learning. It is when you learn to ignore a stimulus that does not convey any meaning.

Habituation can be measured in the rat. A loud noise, say, can induce a startle response in a rat. The rat jumps because it has been startled. If the rat is repeatedly exposed to the noise and that noise has no consequence, the magnitude of the startle response diminishes.

From an evolutionary perspective, habitation is an adaptation that aids survival. It makes good sense for the animal to respond to a stimulus that it has never experienced before. A novel stimulus may, or may not, pose a threat. However, if the stimulus is repeated with no consequences the animal habituates to it. This enables the animal to get on with the important business of survival. Thus the only stimuli that are attended to are those that may pose a threat to survival. A rat, then, should habituate to traffic noise but not to a cat. The cat is a predator. Habituation is important to the researcher and can influence the conclusion arrived at in an experiment (see Research methods box 8.1).

RESEARCH METHODS BOX 8.1

Habituation in psychopharmacology

In Chapter 7 we saw how a drug can increase the action of a neurotransmitter – an agonist. A dopamine agonist, such as amphetamine, makes rats run about (see Clarke and White, 1987). However, different conclusions can be arrived at on the basis of the rat's previous experience.

When an animal is put into a test arena for the first time it explores the environment. This is seen as increased motor activity. Within a one-hour session short-term habituation occurs and the motor activity diminishes. If the rat is exposed to the test environment several times, long-term habituation occurs; the rat does not engage in much exploratory behaviour at all and thus there is a decline in motor activity.

In a study by Chandler et al. (1990) two groups of mice were given a DA agonist. The first group had never experienced the test environment before (they were non-habituated). The second group had been exposed to the test environment many times (the habituated group).

The DA agonist produced very different results in the two groups of mice. Two measures were taken: motor activity and rearing. Rearing is illustrated in Figure 8.1. You can see clearly that the drug appeared to have no effect in the non-habituated mice. Note that the amount of rearing was consistently high (around 40 counts). However, in the habituated mice the baseline of control mice was reduced (about two counts). They had habituated, but after the DA agonist there was a dose-dependent increase in rearing.

This study indicates that the behavioural history of the animal is an important factor in determining the effects of a drug. The response to the drug was dependent on pre-exposure to the test environment. Conclusions from the non-habituated mice would lead to the notion of the drug being devoid of behavioural activity. In the habituated mice the conclusion is different. The DA agonist in these animals produced behavioural activation.

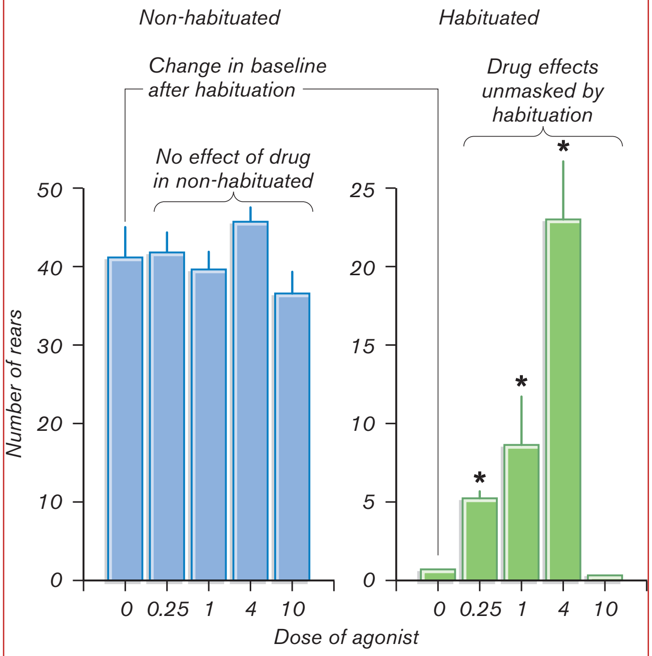


Figure 8.1 Habituation to the test environment

Humans can also habituate (see Applications box 8.1). If we hear a loud noise behind us, we respond by trying to locate its source. This is called the *orienting* response. If we observe that the source of the loud noise is non-threatening (e.g. a builder hammering) and the noise continues, we habituate to the noise. If the sound is indicative of a threat, like gunfire, we locate it and preferably avoid it.

APPLICATIONS BOX 8.1

The Kiss

An example of habituation to auditory warnings was recently evident in the Sussex town of Lewes. An extremely valuable statue by Rodin – The Kiss – was placed on display in a public building. Normally such valuable items come with highly sophisticated security systems. The Kiss had a security guard with a whistle.

Why the low-key approach? Because people have learned to ignore (they are habituated to) electronic alarms and buzzers, such as car alarms. People would, however, respond to someone blowing a whistle.

In the city we hear false alarms sounding all the time; they no longer signal an intruder, say. The novelty of the whistle, and the fact that it has to be blown deliberately, means that anyone hearing it will orient to the source of the sound. Thus someone touching The Kiss will stop in their tracks on hearing the whistle.

Photo 8.1

Reflexes

The response of the organism during habituation is a reflex. A reflex is an automatic response to an external stimulus. Leg jerking in response to a tap on the knee area with a tendon hammer is a reflex.

A reflex involves closely related events. For a reflex to occur, an input stimulus is necessary. The input triggers the cellular events of neurotransmission. Stimulus input is via afferent neurons to the spinal column. The afferent neuron communicates with an interneuron. An interneuron is a neuron that is neither sensory nor motor but connects the two. The interneuron communicates with an efferent neuron. The efferent neuron activates muscles to execute the reflex.

If you touch something hot you automatically retract your hand from the source of the heat (the stimulus). You do not think: 'That's hot! I must remove my hand before I suffer tissue damage' (or words to that effect). The thermal information is sent along afferent neurons that connect to efferent neurons (via the interneuron) and the reflex of hand removal is executed (see Figure 8.2). Thus you avoid getting a serious burn to your hand.

Self-test: What is habituation?

Classical conditioning

While they are automatic responses, reflexes can be subject to learning. The reflex is central to Ivan Pavlov's theory of classical conditioning. Classical conditioning is when a neutral stimulus becomes associated with a stimulus that is able to produce a reflex. The neutral stimulus, which previously had no effect, becomes able to produce the reflex.

Pavlov was investigating digestion in the dog. Incidental to this, Pavlov and his students noticed that dogs would salivate to stimuli that were predictive of feeding time. Like all good scientists they systematically investigated this phenomenon with experiments.

Pavlov put the dogs in a special apparatus that allowed saliva to be collected. When food was put into a dog's mouth, saliva was produced. Saliva contains enzymes that are used in the digestion of food. The saliva-producing response is a reflex to the orosensory stimulus of food in the mouth. In Pavlovian terms, the food is an unconditioned stimulus (UCS) and the production of saliva is an unconditioned response (UCR). A reflex can be described as an unconditioned response to an unconditioned stimulus.

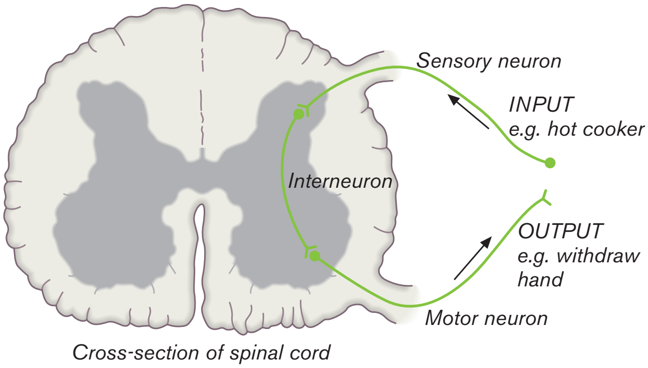


Figure 8.2 A reflex comprises the activation of an afferent nerve connected to an interneuron, which is in turn connected to an efferent neuron

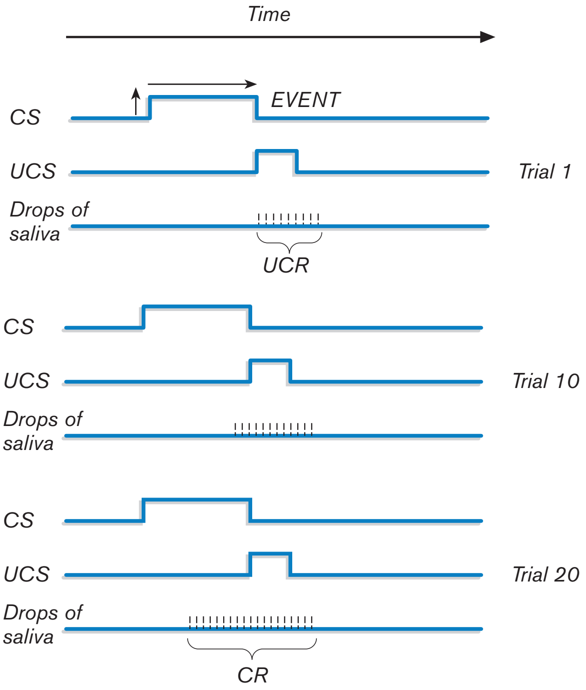


Figure 8.3 The development of classical conditioning: at Trial 1 only the UCS produces salivation; at Trial 20 the CS produces the CR of salivation

So far nothing had been learned by the dog in the experiment. During the next stage of the experiment, a tone was introduced (a bell), which accompanied the presentation of food. Initially, the tone was a neutral stimulus and did not produce a response. However, after a number of tone/food presentations the tone was presented alone and on its own produced salivation in the dog. This tone is referred to as the conditioned stimulus (CS). The response to the tone, in this case salivation, is called the conditioned response (CR). The dog is said to have acquired an association between the tone and the production of food (see Figure 8.3).

Self-test: Describe the basic process of classical conditioning and apply it to habituation.

Measuring the CR

Measuring a CR is not an all-or-nothing observation. Such a measure would put us in danger of missing the subtleties of the conditioning process. There are three main ways of assessing the strength of a CR:

1. Response amplitude How large is the CR? In Pavlov's experiments, how much saliva does the dog produce? The more saliva, the stronger the conditioning.
2. Response probability How many times does a CR occur in response to a CS? A probability of 0.5 (50%) would

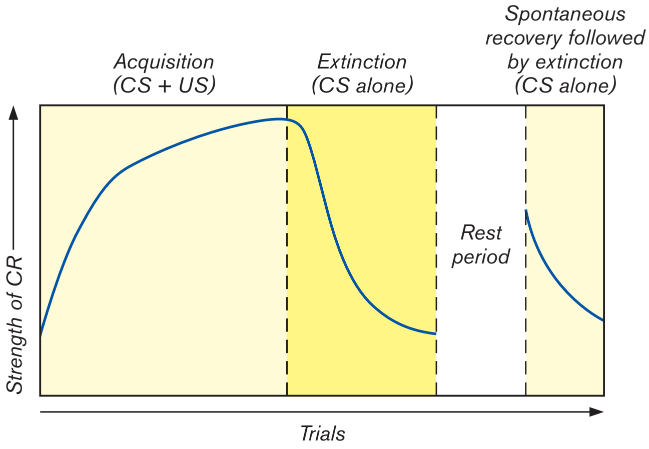


Figure 8.4 The acquisition, extinction and subsequent spontaneous recovery of the CS: acquisition is gradual and when the CS is presented alone extinction occurs in which the animal no longer produces a strong CR; after a period of time the animal is presented with the CS again and a CR is emitted

indicate responding at the level of chance. A CR probability of 0.9 (or 90%) would indicate that there is a strong association between the CS and UCS. How many times does the dog salivate to the CS?

3 Response latency How long is it after the CS that the CR appears? The closer in time they occur, the stronger the conditioning. How long does it take for the dog to salivate after hearing the CS?

Pavlov's laboratory provided the basic premise of classical conditioning. Using this framework, a large number of behaviours can be described. A human example of classical conditioning in action is a phobia (see Chapter 33).

Acquisition

Over successive pairings, the CS gradually becomes associated with the UCS, producing a CR. The more pairings (or trials), the stronger the conditioning (see Figure 8.4). However, numerous CS–UCS pairings do not result in a continual increase in learning – they reach what is called asymptote (a sort of impasse).

Self-test: What are the main measures of a conditioned response?

Extinction

Once asymptote has been reached, presentation of the CS without the UCS would decrease the CR. If we stop giving a dog food after it hears the tone, it will eventually stop salivating to the tone. This is called extinction. The CR is extinguished gradually as the animal experiences the CS without the UCS (see Figure 8.4). Although there are many similarities, extinction is different from habituation (no associations have been made in habituation).

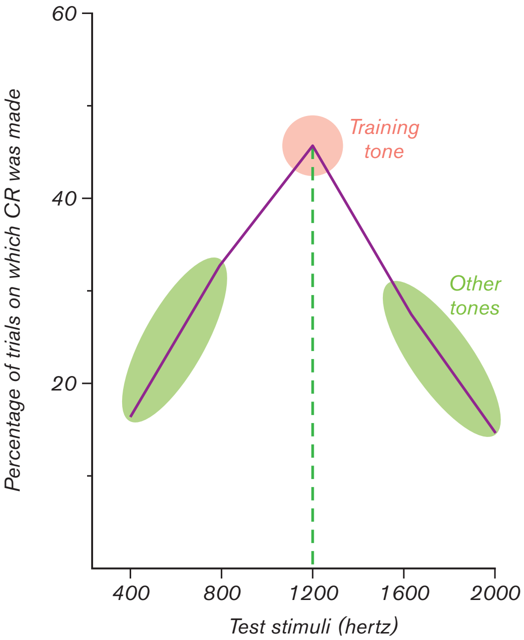


Figure 8.5 The CS can both generalise to like stimuli or be discriminated from other stimuli

Spontaneous recovery

After the extinction of the CR and a period of rest without experimentation, the CR can appear again in response to the CS. This phenomenon is known as spontaneous recovery (see Figure 8.4). The CR is not as strong as it was during earlier training. If training is restarted, learning the CS–UCS pairing will be quicker than it was in the initial learning period. Spontaneous recovery can occur after a substantial rest period, indicating the permanence of learning. Bouton (1994) asserts that extinction is not forgetting, but is similar to proactive interference in which new learning supersedes old.

Stimulus generalisation and stimulus discrimination

Pavlov's experiments used a tone of a particular frequency as the CS. What would happen if another similar, but not identical, tone was used? If the new tone was similar to the CS then the CR would be strong. If the new tone was dissimilar to the CS then the CR would be weak. Similarly, an organism is able to differentiate between stimuli that are similar but not identical to the CS (see Figure 8.5).

Self-test: What is extinction and is it permanent?

Conditioned emotional response

The conditioned emotional response (CER) is the basis for a classically conditioned phobia (see Chapter 33). In experiments to obtain a CER, rats are trained in an operant chamber (see later). In the chamber, the rats press a lever to receive food. Rats are good at this task. Sometimes a tone will sound for 30 seconds. Following the tone an electric shock is given. As training continues, the rat stops pressing the bar for food when the tone is presented. This is called conditioned suppression or the conditioned emotional response (CER).

Is the CR identical to the UCR?

So far in Pavlov's experiments the CR and UCR are both salivation. However, with a more detailed analysis of the saliva, differences in CR and UCR are evident. Saliva contains enzymes that are used for digestion. In the CR, there are fewer of these enzymes than there are in the UCR.

In the CER experiment in which a rat receives an electric shock, the CR and UCR are different. In response to the UCS (shock) the rat's heart rate increases and it jumps about the chamber. The response to the CS (tone) is different from the UCS. In this case, the rat's heart rate decreases and it remains still. The importance of the CR being different from the UCR is exemplified in drug tolerance (see Applications box 8.2).

The relationship between the CS and the UCS

It should have become clear that the CS becomes associated with the UCS. That is, when there is a CS the chance of a UCS is high. The association between CS and UCS varies in strength depending on the temporal characteristics (see Figure 8.6). The temporal relationship between the CS and the UCS is important. Contiguity is when the CS and UCS are presented close together in time. Rescorla (1968) suggested that contiguity was necessary but not sufficient for conditioning. Differential contingency was also required. Differential contingency refers to the likelihood (probability) of a UCS following a CS. If the probability of a UCS following a CS was 0.5, then there would be no learning. If the probability was 0.8, then the CS would be associated with the production of a UCS. If the probability was low (e.g. 0.2), then the absence of a CS indicates a higher likelihood of a UCS.

Self-test: Is the conditioned response the same as the unconditioned response?

Applications

Classical conditioning has been used to explain behaviour such as phobias. Classical conditioning can also be used to explain sexual fetishes (see Activity box 8.1). It is also influential in understanding the phenomenon of drug tolerance and overdose (see Applications box 8.2). Aversive conditioning, as popularised in the book and film *A Clockwork Orange*, is also used in the psychopharmacological treatment of alcoholism (see Applications box 8.3).

APPLICATIONS BOX 8.2

Drug tolerance and overdose

The body likes to maintain homeostasis. This means that it does not like external agents upsetting its balance. Opponent processes compensate for changes in the body to achieve homeostasis. If you take morphine for pain relief the body compensates for the drug by producing a reaction in the opposite direction: more pain. After the drug has been given a number of times its effect is weakened. This is called tolerance. Tolerance could be seen as a pure biological activity in response to a drug. However, classical conditioning is very important in drug tolerance and can account for the overdose effect to a regular dose.

Using the example of heroin, the drug is a UCS that produces a UCR (euphoria and analgesia). However, drugs are not taken in an environmental vacuum and plenty of stimuli are associated with heroin intake (e.g. syringes, tin foil etc.). These stimuli act as a CS. The CS then produces a CR. The CR is the compensatory response from the body in the opposite direction. The CR produces dysphoria and hyperalgesia. Thus the compensatory CR negates the effect of the drug. The effect on the person is one of tolerance and the need for greater quantities of the drug in order to experience an effect.

Classical conditioning can also account for the overdose effect to a regular dose. Most people take their drug in a particular environment. The very nature of heroin use means it has to be taken in a clandestine manner. All the cues in the environment provide the users with a CR. What happens if you take the drug user out of their environment, put them somewhere new, and give them their regular dose? They may well die from their regular dose in what looks like an overdose. In the new environment the cues are no longer there to provide the user with a CR. The absence of the compensatory CR means that the intake of their normal dose of heroin has a greater effect because it does not have to account for the CR.

This is an effect that has been studied systematically in the rat under controlled conditions (Siegel et al., 1982). In this experiment one group of rats was exposed to heroin in the test environment and another in a different environment. A third group received neither (the control group). The group that received the heroin in a different environment showed the overdose effect, whereas the rats that received the same dose in the test environment did not.

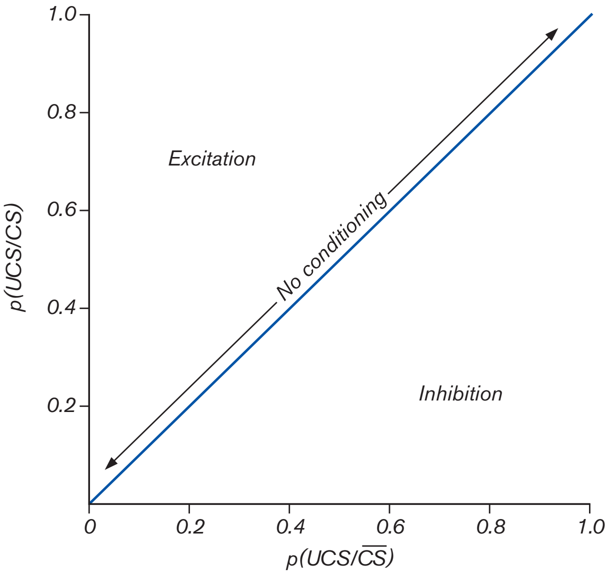


Figure 8.6 The temporal relationship between the CS and UCS: along the diagonal line there is no conditioning because a CS does not convey any information about the UCS; above the line the UCS has a higher probability of occurring if there has been a CS; below the line the probability of a UCS is higher in the absence of a CS

Operant conditioning

Operant conditioning (or instrumental conditioning) is about the organism operating in the environment to produce an outcome. If we do something and the outcome is good, then there is a greater chance we will do it again.

The law of effect

Thorndike (1898) put a cat in a cage with a latch on the door. Outside, he placed cat food. The cat wanted the food, moved around and scratched at the cage. Eventually, by accident the cat knocked the latch on the door. The door opened; the cat got the food. Successive trials of this nature led the cat to gain access to the food quickly. The behaviour exhibited by the cat was strengthened by its relationship with reward. Thorndike referred to this as the *law of effect*. In essence, the cat learns which of its many behaviours leads to freedom and food. It is a gradual process (see Figure 8.7), which leads to the strengthening of a stimulus–response (S–R) relationship.

APPLICATIONS BOX 8.3

Preventing alcohol consumption

The saying goes – one's too many and a hundred isn't enough. This is true for alcoholics. They can never have just one drink. Once they start, they just keep on going.

One way of preventing drinking is to stop the first drink. Easier said than done! Alcohol is highly addictive and people may have a genetic predisposition to it.

One method is to make the effects of alcohol unpleasant. This is called counterconditioning (an aversion therapy; see also Chapter 34), in which the pleasant effects of alcohol are replaced with unpleasant effects (see Schwartz, 1984).

To achieve counterconditioning the pleasant effects of the drug are replaced by nausea and vomiting. This can be induced by another drug called an emetic. Thus the unpleasant effects of the drug become associated with the taste of alcohol. Hopefully this should be sufficient for the alcoholic to avoid future drinking.

Another drug called disulfiram (Antabuse) is also used to produce unpleasant effects if alcohol is consumed. If it is consumed there is a rise in toxic metabolites. This toxicity produces facial flushing, nausea, vomiting, dizziness and confusion, shortness of breath and changes in heart rate (see Feldman et al., 1997). Altogether this is an unpleasant effect.

Disulfiram can also be placed within a classical conditioning framework. The benefit of disulfiram is that its pharmacological action lasts a number of days. Therefore the process of conditioning can take place outside a clinic.

Behaviourism

Skinner was instrumental in shaping behaviourism (see Chapter 2) and put forward the view that behaviour followed laws (see Focus point 8.1). Skinner experimented with pigeons in a box, which became known as the Skinner box (or operant chamber; see Photo 8.2). Skinner boxes are used with many animals, especially rats. Using the laws of behaviourism, rats can be trained to perform complex laboratory tasks and also other activities that are associated

ACTIVITY BOX 8.1

Fetishes

Fetishes are unusual sexual attachments. You only have to glance at late-night television to see that certain objects are linked with sexual arousal. The boot or high-heel fetish that many men would appear to have can be induced by classical conditioning. Rachman and Hodgson (1968) conducted such an experiment. They exposed people to pornographic images (UCS) along with neutral stimuli (CS). The pornographic images produced sexual arousal (UCR). After a number of UCS–CS exposures the CS was presented and produced sexual arousal in its own right (CR).

Using this framework let your imagination run wild and apply scenarios to whatever fetish springs to your mind. It may be the case that some males like pierced belly buttons because this is associated with their early sexual experiences in which women had staples across their midriffs (e.g. as magazine centrefolds)!

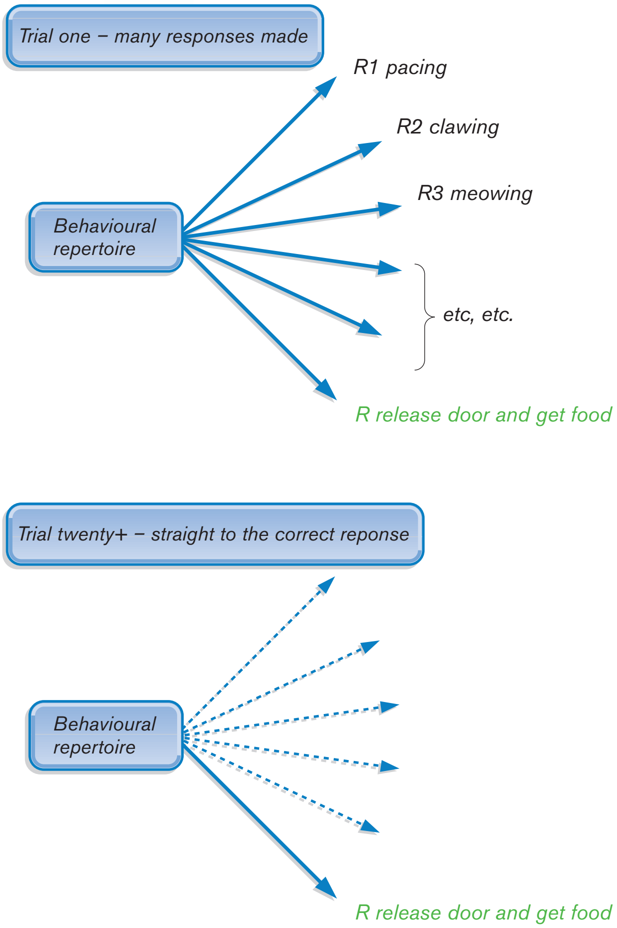

Trial one – many responses made
Behavioural repertoire
R1 pacing
R2 clawing
R3 meowing
etc, etc.
R release door and get food
Trial twenty+ – straight to the correct reponse
Behavioural repertoire
R release door and get food

Figure 8.7 The law of effect: after a number of trials the cat emits the correct response

FOCUS POINT 8.1

Skinner’s view

According to Skinner (1971), ‘As a science of behaviour adopts the strategy of physics and biology, the autonomous agent to which behaviour has traditionally been attributed is replaced by the environment – the environment in which the species evolved and in which the behaviour of the individual is shaped and maintained.’

more with dogs (see Applications box 8.4). The basic premise is the same as that of the law of effect: S–R associations.

Reinforcement

Fundamental to operant conditioning is reinforcement. Reinforcement is when the consequences of a response increase the probability that the response will reoccur. If a rat presses a lever and gets food, it will be more likely to press the lever again. If you work hard at an essay and get a good mark, you are more likely to work hard at your next essay. The first example uses a primary reinforcer (e.g. food and water). The latter is an example of a secondary reinforcer. A secondary reinforcer is something that does not satisfy a physical need (e.g. money, praise or attention).

APPLICATIONS BOX 8.4

Landmines and rats

In war-torn areas of the world, landmines are often placed with devastating consequences. Metal detectors are not always effective and dogs can be too heavy. Thus the rat can be used or, more specifically, the Gambian giant pouched rats. Growing to a maximum weight of 2.8 kilograms it can scamper around a minefield without the risk of detonating antipersonnel devices that can be triggered by dogs. The rats are trained to detect mines and, when they locate one, they stop, sniff and start to scratch.

ADVANCE
REJECT

Photo 8.2 The Skinner box.

Positive and negative reinforcement

Using reinforcement, behaviours can be selected and strengthened. There are two types of reinforcement: positive and negative. Positive reinforcement is when a reinforcer is presented after a response and increases the likelihood of that response recurring.

In the animal experiments, food is a positive reinforcer. For humans, money and praise (particularly in children) are positive reinforcers. Basically, you get something you want after you have done something (e.g. wages for working). Recently an experiment with monkeys demonstrated that they would reject unequal pay. In this experiment, they would not participate in the experiment if

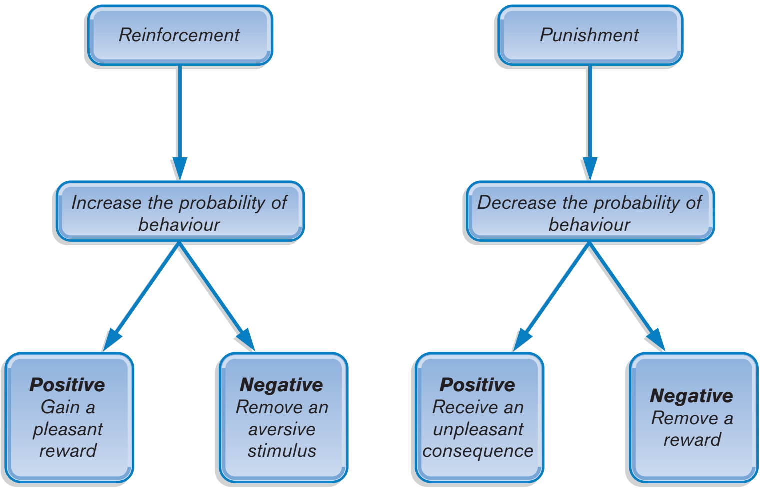

Reinforcement
Increase the probability of behaviour
Positive
Gain a pleasant reward
Negative
Remove an aversive stimulus
Punishment
Decrease the probability of behaviour
Positive
Receive an unpleasant consequence
Negative
Remove a reward

Figure 8.8 Reinforcement increases the likelihood of a behaviour while punishment decreases the likelihood of a behaviour

they saw another monkey get a better reward for less work (Brosnan and De Waal, 2003). Clearly, there is something more complex occurring in these monkeys than just associative learning.

Negative reinforcement also increases the probability of a particular response. However, in this case, it is the removal of an unpleasant event or circumstance that strengthens a response. For example, a rat will press a bar or lever to escape an electric shock. When a stimulus is indicative of electric shock, the rat will press a lever and thus avoid the shock. Similarly, humans respond to negative reinforcement. The roles of positive and negative reinforcement have been used to account for drug addiction (see Chapter 9).

Punishment

The first point to note about punishment is that it is *not* negative reinforcement (see Figure 8.8). The difference between punishment and negative reinforcement focuses on what it does to a particular behaviour. Negative reinforcement *increases* the likelihood of a particular behaviour, whereas punishment *decreases* the likelihood of a particular behaviour. Thus, punishment is used to stop a behaviour whereas reinforcement is used to promote a behaviour.

Punishment can be subdivided into positive and negative punishment. Positive punishment is when behaviour leads to an undesired consequence. In the rat this could be an electric shock. In the human it could be a fine for illegal parking. Negative punishment is when behaviour results in the removal of or failure to obtain a desired reinforcer. In the rat, this could be restricted access to food (e.g. Chandler and Stolerman, 1997). In the child, it could be the removal of television time.

In order for punishment to be as effective as possible it should contain three features. First, the punishment has to come straight after the behaviour; there has to be contiguity between the response and the punishment. Second, the behaviour has to be consistently punished; failure to be consistent means that an association between the behaviour and the punishment is not established. Third, the punishment needs to be sufficiently aversive, but not too aversive. If the punishment is not sufficient then the behaviour may continue. A slap on the wrist for armed robbery is insufficient to stop the criminal re-offending. If the punishment is too aversive, then other problems may occur, like high levels of fear and anxiety.

There are also a number of problems with punishment. The first is that the recipient of punishment may, via classical conditioning, come to fear the person *giving* the punishment rather than the punishment itself. In such a scenario, there is a failure to modify the undesired behaviour. Additionally, there is a new problem created – fear – which can be very difficult to eliminate (LeDoux, 2000). For example, a dog requires training. During training, the trainer may punish the dog. Consequently the dog may cower at the sight of its trainer (a CER) and not make the association between behaviour and punishment.

Due to the unpleasant consequences of punishment, a person may seek to escape it. To escape punishment, they may cheat and lie. If escape is not possible, the person may consider aggression and attack. Think of a bank robber – the consequence of punishment is sufficient to make the robber challenge police with violence. If eventually caught, the robber may lie about the crime. The robber will still engage in the activity, but become more devious in order to avoid detection.

Punishment may *suppress* many behaviours rather than eliminate one. The person may just give up and become apathetic. Finally, the punished may start to imitate the punisher. A child will imitate and learn from its parents. If parents use physical punishment, this is likely to be seen in their children.

Self-test: Define the difference between positive reinforcement, negative reinforcement and punishment.

Schedules of reinforcement

When a particular behaviour is reinforced every time, it is said to be on a continuous reinforcement (CRF) schedule. Behaviourists consider all our actions under the control of operant conditioning. Clearly, we are not on a CRF schedule for all our behaviours, so how is behaviour maintained in the absence of a CRF schedule?

The answer can be found when we consider partial reinforcement. With partial reinforcement, the organism is not reinforced every time it responds. There are four schedules of reinforcement. The nature of the schedule can influence the response output of the organism (or, as in the examples that follow, the rat). After reading this section on schedules of reinforcement, try the exercise in Activity box 8.2.

ACTIVITY BOX 8.2

Schedules of reinforcement

According to behaviourists we are controlled by schedules of reinforcement.

As you go about your daily business you may not be aware that you are being influenced by these schedules. Take a close look at your environment and try to determine what the schedules are.

To help you on your way, simple activities like using a pelican crossing place you on a schedule. You have to press a button to activate the lights. This may happen immediately or you may have to wait a short while.

What are the schedules? (Note that there may be more than one schedule in operation at any time.)

Fixed ratio (FR) schedules

With a fixed ratio (FR) schedule, the rat is reinforced after a number of bar presses. If the schedule is said to be FR10, this means that the rat is reinforced after the 10th response has been made. Similarly on an FR30 schedule the 30th response is reinforced. People on piecework are on FR schedules (i.e. they get paid for, say, every 100 boxes packed).

A rat on an FR schedule will respond (work) rapidly until the reinforcer is delivered. After reinforcement there is a pause, which is followed by another period of rapid responding (see Figure 8.9).

Variable ratio (VR) schedules

A variable ratio (VR) schedule is similar to the FR schedule, except that reinforcement occurs after a variable amount of responses. If the rat is on a VR10 schedule then it is reinforced *on average* after 10 responses. However, this varies around an average of 10. Sometimes the rat receives reinforcement after five responses and other times after 15. On a VR schedule, the rat does not know exactly when the reinforcement is going to occur. A VR schedule produces a high rate of rapid and constant responding (see Figure 8.9).

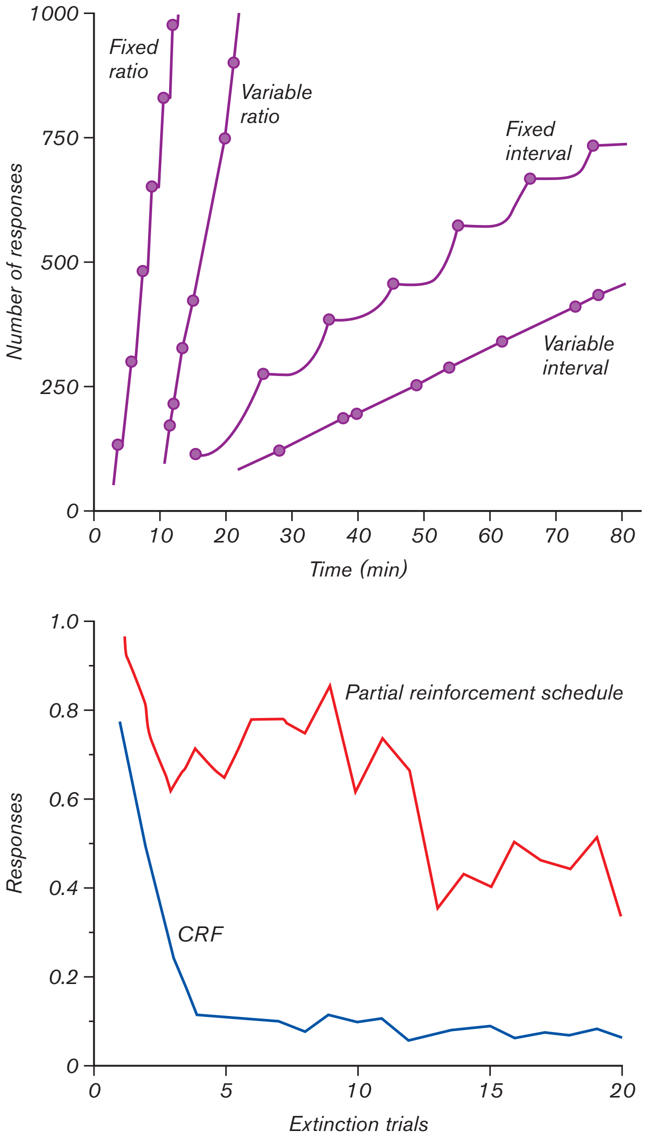


Figure 8.9 (a) Cumulative chart of the different schedules of reinforcement: the chart depicts the responses made; each response is added to the previous one(b) Extinction of a partial reinforcement schedule

The VR schedule is resistant to extinction. This is demonstrated clearly in gamblers. Slot machines are on VR schedules: sometimes you win but many times you do not. A machine is programmed to pay out on a VR schedule. You will get reinforced every so often but you cannot predict the payout. This schedule means that you will keep putting money in the machine.

Fixed interval (FI) schedules

A fixed interval (FI) schedule is when, after a specified period of time the rat receives reinforcement only if it has pressed the bar during that time. A rat on an FI30 schedule receives reinforcement every 30 seconds if it has pressed the bar. The rat may press the bar once or many times in the intervening period between reinforcements. A clear scallop is produced in the cumulative response record (see Figure 8.9). This happens because the rat learns not to respond at the beginning of the interval and only starts responding towards the end of the interval.

Variable interval (VI) schedules

A rat on a variable interval (VI) schedule receives reinforcement after an average period of time only if it has responded correctly. On a VI30 schedule the rat receives reinforcement on average after 30 seconds, but sometimes after 20 seconds and sometimes after 40. This schedule produces slow but consistent responding (see Figure 8.9). Home Office inspectors (see Chapter 6) visit animal laboratories on a VI schedule to spot-check that the law is being adhered to and animal welfare maintained. If they arrived on an FI schedule then the laboratories could predict an inspection and could put on a 'good show' just for the inspectors.

Self-test: Describe the different schedules of reinforcement.

Acquisition

Animals, like people, do not learn immediately. A number of learning trials have to be completed before a rat can respond to a stimulus reliably. Many of the experiments you will read about have involved long, and sometimes complex, training regimes. The more complex the task, the longer the training. In the example of rats as drug connoisseurs, Garcha and Stolerman (1989) required up to 90 sessions of 15 minutes' duration for the rat to be a reliable detector of nicotine.

Shaping and conditioning by successive approximations

A complex piece of behaviour cannot be learned overnight. In order to train an animal one must start with simple behaviours, which contribute to the overall goal behaviour. Once acquired, new behaviours can be worked on and refined. This process is called *shaping*. The shaping of the smaller subsets of behaviours is called 'shaping of successive approximations' – that is, one reinforces behaviours that are getting closer to the desired behaviour. Such procedures are used regularly in training animals (dogs in particular).

Extinction

On a CRF, the animal stops responding soon after reinforcement stops. Initially, the rat presses the lever rapidly, but eventually this diminishes until it stops responding altogether. Partial reinforcement schedules make extinction of a response more difficult (see Figure 8.9).

Spontaneous recovery

As is the case with classical conditioning, spontaneous recovery can occur. After a period of absence from training, the rat, on re-acquaintance with the apparatus, will start responding again.

Discrimination and generalisation

The animal is able to discriminate between stimuli that bring about reinforcement and stimuli that do not. These stimuli are called discriminative stimuli (SD). A pigeon will peck an illuminated key for food reinforcement. It will peck any key at first. However, if reinforcement is made contingent on pressing a green key (and not a red key) the pigeon learns to discriminate between the two stimuli. The green switch is called S^+ (a stimulus that is contingent with reinforcement). The red key is S^- (a stimulus that is *not* contingent with reinforcement). The colour of the key is a clear SD. Other discriminative stimuli can be subtler. A pigeon may go on to discriminate between shades of green, for instance.

Unlike discriminative learning, generalisation refers to the phenomenon where an animal responds to different stimuli. The pigeon that is trained to discriminate between coloured switches initially generalises to all coloured switches.

Interoceptive and exteroceptive stimuli

Up to this point the animal has produced a response to an SD (a light or a tone). This is an exteroceptive stimulus (sometimes called a stimulus cue). The rat detects the SD, presses a lever and gets a reward.

A rat can also respond to its internal physiological state (an interoceptive stimulus or cue). A procedure called drug discrimination is used to understand the stimulus properties of drugs. The rat uses the feelings derived from a drug to determine which bar in the operant chamber leads to reinforcement (see Research methods box 8.2).

Self-test: Describe how operant conditioning can be used to train an animal.

RESEARCH METHODS BOX 8.2

Drug discrimination: rats as drug connoisseurs

People take drugs for a number of reasons. One is that they like the effects of a drug (e.g. euphoria, alertness). These properties make up the feeling of a drug and thus its stimulus properties. People who smoke are aware of the different amounts of nicotine delivered from various cigarettes. Other drugs of abuse are also readily discriminated in both man and animal (e.g. heroin).

The capacity to detect a drug effect is also mirrored in the animals. After training, drugs can act as discriminative stimuli. By behaving appropriately the animal can indicate its ability to detect the presence of the drug in the body.

Why use animals?

Stolerman (1993) said, 'Data from animals are often more precise, detailed and extensive than that from humans because animals may be trained and tested over longer periods of time and because they have more rigorously controlled behavioural and pharmacological histories.'

How do they do this? They can't talk!

Of course, the use of animals does not permit the verbal measure of drug effects. In order to determine the stimulus properties of a drug the animal has to perform an operant task, such as pressing a bar for food reinforcement.

There are two bars, or levers, in the Skinner box. One is associated with the drug effect and results in reward. The other is associated with the vehicle (an inert injection of saline). This permits the data to be analysed in terms of overall responding (e.g. no specific drug effects) and drug–bar responding (specific discrimination of the bars).

The process of training a rat to discriminate a drug from saline is long. First, the rat has to be acclimatised to the environment and placed on restricted diet to motivate it to bar-press. The rat is introduced to the food delivery system in the operant chamber. Then one bar is put in the chamber and made contingent for reinforcement (FR1). This is reversed the next day so the other bar is associated with reinforcement. Progressively the FR is increased to FR10. When the rat gets good at this the injections of a drug start. Only one bar is contingent for reinforcement. When given a drug only the drug bar yields food; with saline only, the saline bar yields food. The process continues with saline and drug pairings in a random order. Both bars are present in the chamber.

Stolerman then introduces punishment to the process: when the rat makes an incorrect response the FR schedule is reset. If the animal makes nine correct responses and then makes one wrong one, it has to start again at the beginning. Additionally a VI component is introduced and is increased to 60 seconds. The rat is then on a tandem schedule (VI60–FR10). The VI schedule stops the animal from receiving too many reinforcers in a session and also stops it being able to predict reward. Thus the rat works hard for little pay.

This process takes many months. Once the rats can reliably discriminate the drug from saline, tests can be carried out to see if the stimulus properties are dose dependent; they can then generalise to other drugs.

Alternatively, they can be blocked by antagonists of the training drug. A drug that is like the training drug will generalise to the discriminative cue; drugs that are not like the training drug appear to be more like saline.

The stimulus may be important to explain why people smoke. Perkins et al. (1994) showed that people can discriminate between different doses of nicotine delivered in a nasal spray. Pratt et al. (1983) used the procedure described above and showed that rats could discriminate nicotine from saline reliably without a reduction in the overall response rate. The effects of nicotine are mediated by a receptor for ACh in the brain. They are sensitive to antagonism from nicotine receptor antagonists.

Drug discrimination experiments can tell us a lot about the nature of a drug's effect and the mechanisms underlying that effect.

Cognition in animals

Strict behaviourists reject all forms of cognitive explanation that are in opposition to behavioural explanations, but it is possible to conceptualise them in cognitive terms see (Bouton and Moody, 2004) or an interaction of the two (McDonald et al., 2004). More recent theories of animal learning do argue that cognition and cognitive processes underlie learning in animals. Cognition here refers to mental processes that are not subject to direct behavioural observation. In fact, according to Lieberman (2000), the behaviourist view and cognitive view of animal learning have become increasingly similar.

Tolman (1948), who championed the cognitive view, presented the idea of cognitive maps and latent learning. Rats learnt to navigate a maze quickly despite an absence of reward. When given reward these rats were quick to learn the whereabouts of the reinforcer. Tolman claimed that the rats had a cognitive map of the maze. After receiving reward the behaviour of the rat became observable, whereas previously learning was not observable. Behaviourists will account for observable behaviour. Clearly, from Tolman's studies, learning had occurred that was not directly observable. This is referred to as latent learning.

Tolman (1932, 1959) argued that behaviour is goal directed and that animals (and humans) act as if they expect certain behaviours to lead to a desired goal. Dickinson (1989) has further accounted for expectancy in both classical and operant conditioning. His concepts of expectancy involve two types of information.

First, the contiguity between events gives rise to a representation of the associative link between those events. In Pavlov's experiments, the dog developed a representation of the CS and UCS, which would elicit the CR in response to the CS. That is, the dog develops associative expectations that the bell precedes food and produces salivation in response to the expectation of food.

Second, expectancy involves the belief that a particular behaviour will have a specific effect. In the operant conditioning experiment, the rat presses a bar to get food. That is, there is a *belief* that the behavioural response results in reward. Dickinson (1989) claims that, with increased training, stimulus–response habits emerge that do not involve the expectation that a particular behaviour will lead to reinforcement, i.e. the cognitive phenomenon of expectancy can eventually change into an automatic habit.

The area of animal cognition focuses on how the animal uses experience to form the basis for future behaviour. Of course, how the past affects our behaviour is to do with memory. Cognitive psychologists have demonstrated that there are numerous types of memory (see Chapter 14). One type of memory that has been extensively investigated in the animal is spatial learning and this has a neurophysiological substrate in the hippocampus.

In the experiments by Tolman, a maze was used. These experiments required the animal to retain information about the spatial features of the apparatus. There are numerous other methods of assessing memory in the animal (see Sarter et al., 1992a, 1992b). One method of assessing spatial memory is the water maze, which has been used to study potential treatments for Alzheimer's disease (see Research methods box 8.3; Activity box 8.3).

RESEARCH METHODS BOX 8.3

The water maze

A water maze consists of a pool of water (with a circumference of about two metres) from which a rat cannot escape (see Fig. 8.10). The water is coloured to obscure a platform just below the surface. The rat is placed in the pool and to get out has to find the platform. Initially the rat just swims about until, by accident, it finds the platform. After a number of trials the rat is able to find the platform relatively easily. The rat uses spatial cues in the environment to locate the platform.

There are a number of measures that can be used to determine spatial learning in the water maze:

- latency
- path length
- average speed
- side wall proximity
- directionality
- quadrant times
- quadrant distances.

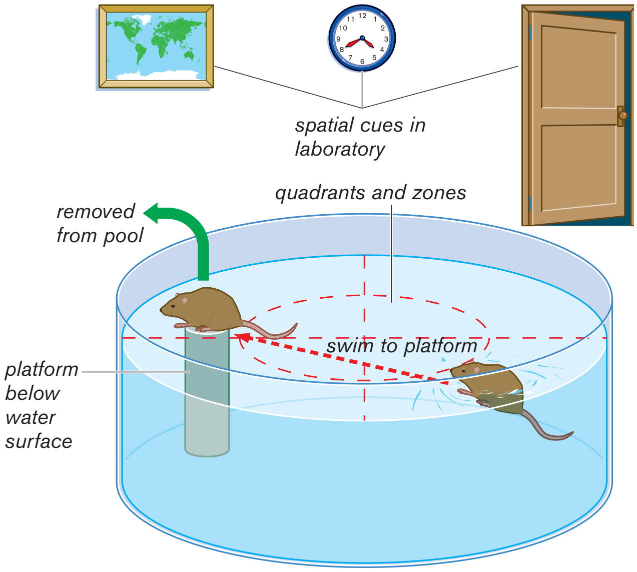


Figure 8.10 The water maze

ACTIVITY BOX 8.3

Animal memory

- **Can animals remember?** Think of pets or animals in the wild. Does your dog remember? Do elephants ever forget?
- **How would you go about assessing memory in different animals?** Rats cannot do digit span and verbal tasks. You cannot ask them questions and ask them to repeat them after an interval. They can do spatial tasks such as mazes.
- **What sort of memory are you measuring?** There are many types of memory for example, episodic, long term, semantic and working memory.
- **What else might you be measuring as well as memory?** Memory is made up of different processes, e.g. attention, learning, encoding, storage and retrieval.

The phenomenon of learned helplessness (Seligman, 1975) also points to cognitive learning. The animal has to compute the probabilities of affecting the environment and receiving reward. In learned helplessness, a chance level of affecting the environment leads to there being no predictive information about reward contingencies. Underlying the computation of probability are neural mechanisms. Recently, DA neurons of the midbrain have been shown to be differentially active on presentation of different probabilities of reward (Fiorillo et al., 2003). Matsumoto et al. (2003) identified the lateral and medial prefrontal cortex (mPFC) as a site that is active when there is anticipation of reward. The mPFC was also identified as the place where responses are selected.

It may not be possible, and it may also be unnecessary, to provide a definitive answer to the cognitive versus associative learning debate. Lieberman (2000) states that the two forms of learning can coexist. Cognitive learning involves attention and concepts of abstraction and expectation. Associative learning may represent automatic processes that are well learnt and do not require conscious attention. This view is rather similar to the cognitive approach to the function of the frontal lobes proposed by Norman and Shallice (1980).

Self-test: What is latent learning?

The neural bases of learning: long-term potentiation (LTP)

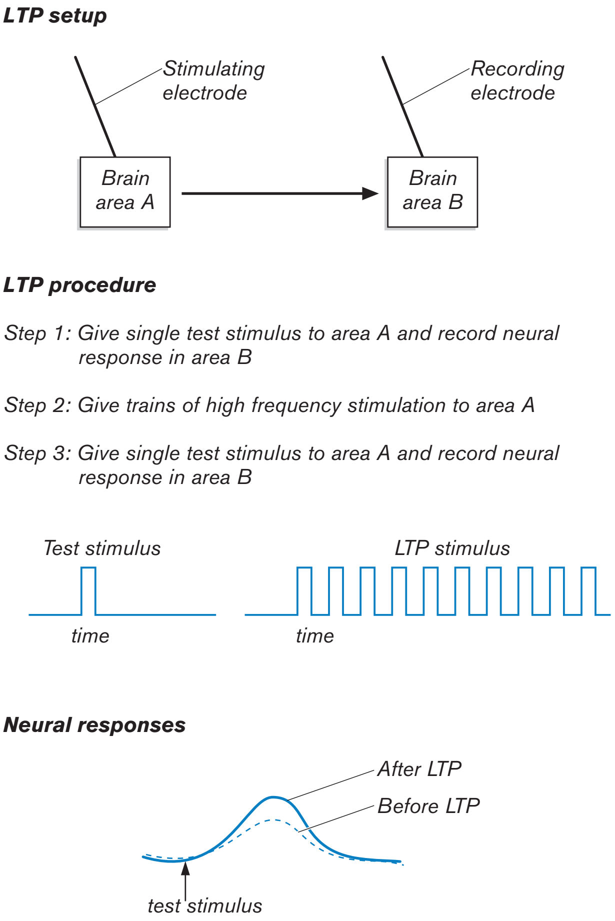
These studies just examined provide neural correlates of behaviour. The temporal lobes and the hippocampus are involved in learning and memory. Understanding the neuroanatomy is important but it does not tell us about the processes of learning and memory. Changes in hippocampal activity during associative learning have been identified (e.g. Wirth et al., 2003).

What happens at the neural level?

Hebb's (1949) initial theory of changes in synaptic transmission has since been supported and refined by experimental evidence (Bliss and Lomo, 1973). With the induction of long-term potentiation (LTP) there is a facilitation of synaptic transmission. After there has been a period of high-frequency electrical stimulation of the presynaptic neuron by an electrode, the response to low-frequency stimulation is potentiated.

LTP can last for a long time and requires the activation of both pre- and postsynaptic neurons (Bliss and Gardner-Medwin, 1973; Sastry et al., 1986). Interestingly, in the context of this chapter on learning, Iriki et al. (1989) have found changes in the rat hippocampus after conditioning that are similar to LTP (see Figure 8.11).

The search for the neural mechanisms underlying LTP has focused primarily on the NMDA and AMPA receptors. The NMDA and AMPA receptors are configured to receive messages from glutamate (an excitatory amino acid). The NMDA receptor and LTP share some similarities. Instead of high-frequency stimulation, the NMDA receptor can produce LTP from converging inputs (temporal and spatial summation).



Step 1: Give single test stimulus to area A and record neural response in area B

Step 2: Give trains of high frequency stimulation to area A

Step 3: Give single test stimulus to area A and record neural response in area B

Figure 8.11 The method to induce LTP in the hippocampus: a stimulating electrode in brain area (a) influences brain area (b); after high-frequency stimulation the response of brain area (b) is increased or potentiated
Source: adapted from LeDoux (1998)

If the NMDA receptor is to respond fully it requires: (1) glutamate to bind to the NMDA and AMPA receptors, and (2) partial depolarisation of the postsynaptic neuron. In the second requirement, partial depolarisations are produced by inputs to the AMPA receptor or other receptors nearby (see Figure 8.12). Thus, naturally occurring LTP requires the convergence of two inputs.

The postsynaptic neuron responds to stimulation by producing a series of biochemical events. Without going into fine detail, these events increase both glutamate release and the number of AMPA receptors. Therefore the initial stimulation results in synaptic changes that can be enduring. Supporting evidence for the involvement of the NMDA receptor comes from 'knockout mice', which do not express the receptor (Tsien et al., 1996) and psychopharmacological studies that use drugs to block the NMDA receptor (Morris et al., 1986).

While LTP offers great insight into putative neural mechanisms of memory there is still a link to be made with the psychology of learning and memory. The work of the cognitive neuroscientist is never done!

Self-test: Describe learning at the synapse.

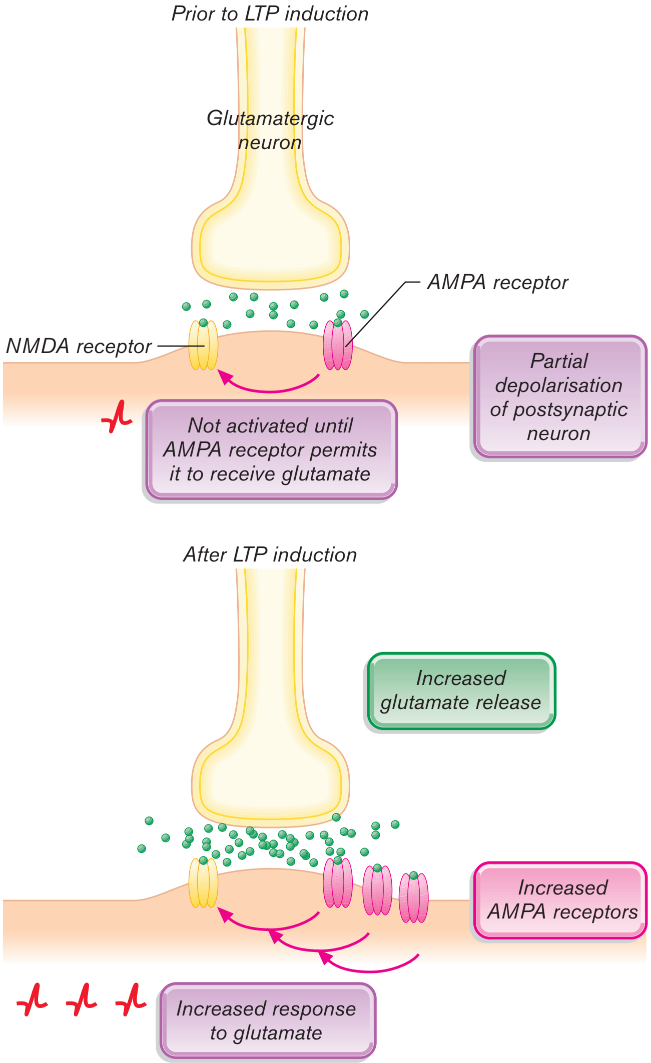

Prior to LTP induction
Glutamatergic neuron
AMPA receptor
NMDA receptor
Partial depolarisation of postsynaptic neuron
Not activated until AMPA receptor permits it to receive glutamate
After LTP induction
Increased glutamate release
Increased AMPA receptors
Increased response to glutamate

Figure 8.12 The role of glutamate receptors in LTP: repeated activation of the AMPA receptor leads to long-term potentiation in the synaptic response to glutamate

Learning outcomes

When you have completed this chapter, you should be able to:

1 Describe the two main theories of associative learning.
2 Apply the principles of associative learning to real-world situations.
3 Describe the limitations of associative learning.
4 Describe the possible neural mechanisms underlying learning.

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2 Using the terminology of operant conditioning, how would you modify the behaviour of a child who continues to bite other children while playing?

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3 Learning takes place at different levels of analysis. Discuss.

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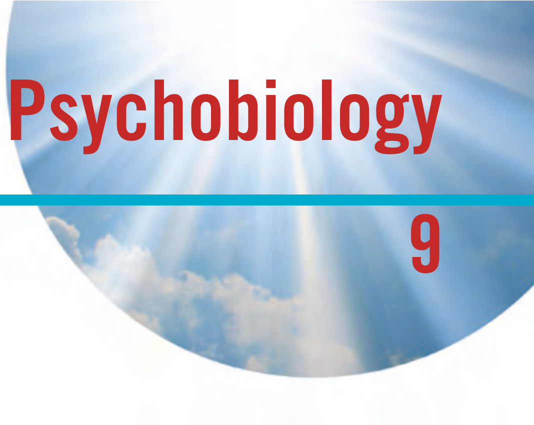

Psychobiology

9

Motivation, brain reward mechanisms and behaviour

Route map

Why do we eat, drink and sometimes be merry? This chapter addresses the biological basis of three highly motivated behaviours. The first section addresses the possible neural mechanisms underlying addiction. The actions of two illegal drugs, cocaine and amphetamine and the legal drug nicotine are explored. The actions of these and other drugs are placed within the context of the general theories of addiction.

Eating is a behaviour that has generated a great deal of interest, especially because of the increasing prevalence of eating disorders. The brain mechanisms involved in eating are investigated, with particular emphasis on the hypothalamus.

Drinking is an essential behaviour and its neural substrates are described. The motivation to drink is important for our survival and, again, the brain is central to this behaviour.

Introduction

We are highly motivated to engage in some behaviours (see Chapter 27 for the theories about this). This chapter addresses a biological basis of motivation. It is clear that there is a physiological necessity for eating and drinking: without food and water the organism will stop functioning. However, people eat for pleasure and are highly motivated to take certain drugs, which do not appear to have any physiological benefit (see Activity box 9.1).

Substance misuse

Drug misuse is an increasingly growing concern. Many people are using drugs for recreational purposes. Along with misuse there may be a number of other problems: criminality, poverty, poor health and psychological problems.

The question of why people take drugs defies one definitive answer. There are a number of circumstances that could induce drug-taking behaviour, ranging from peer pressure to stress relief. To understand the factors involved is a multidisciplinary task. However, psychobiology has made advances in the understanding of the neural mechanisms involved once the drug has been consumed. These mechanisms are thought to be responsible for addiction.

To illustrate the themes of substance misuse we will look at the examples of cocaine and amphetamine, two illegal drugs, and nicotine, a legal drug available at a price. The basic premise of these drugs can be applied to numerous other substances.

ACTIVITY BOX 9.1

Drug-taking motivations

Why do people take drugs?

This sounds like a simple question. Try to answer it.

You should have come up with a number of reasons, such as peer pressure, relief from boredom and escapism. All are valid.

Why do people continue to take drugs?

This is a more difficult question. What is your answer?

I would imagine you would say because they are addicted. This gives rise to the next question.

What is addiction?

There is no simple answer to this. This chapter will focus on the biological mechanisms that are thought to underlie addiction.

What is addiction?

The word addiction is often used interchangeably with dependence and abuse. Altman et al. (1996) provided a description of these terms (see Focus point 9.1). The net effect of substance misuse is to impact on daily life and not just the life of the misuser. Once started, the drug user may have severe difficulty giving up (see Activity box 9.2).

FOCUS POINT 9.1

Altman et al. (1996) on addiction, dependence and abuse

Addiction is the extreme or psychopathological state where control over drug use is lost.

Dependence is the state of needing a drug to operate within normal limits.

Abuse is the use of drugs, which leads to problems for the individual.

ACTIVITY BOX 9.2

Giving up is hard to do

It is not a simple task to give up taking drugs.

- In what ways do people try to give up drugs?
- What are the psychobiological roots of these?

It would be convenient if a drug user could take another drug to stop the addiction. Unfortunately, addiction is very difficult to treat; there is no panacea.

There is a range of options for the drug user, from counselling to detoxification using replacement strategies and withdrawal. However, relapse is likely and many do not benefit from intervention.

New ways are being investigated to achieve a greater success rate. Biotechnology companies are attempting to stop the passage of various drugs to the brain, using immunology to fight the drug (see O'Brien, 1997). Such immunological treatments mean the drug cannot gain access to the brain, and its reinforcing properties are negated. This is an area that offers some hope and is still in development.

A reward pathway

A number of methods are used to determine the reward pathways in the brain and the site of action of drugs in animals (see Stolerman, 1992):

- intracranial self-stimulation (ICSS)
- drug self-administration
- conditioned place preference (CPP).

Using the criteria for animal models (see Chapter 6), you may wish to assess how valid these methods are in their effort to model addiction.

Olds and Milner (1954) first used the technique of ICSS, in which they placed electrodes into the rat brain and found that the rat would press a lever to self-administer electrical stimulation to certain areas of the brain. The areas of the brain that mediated electrical stimulation also contained high levels of DA (Corbett and Wise, 1980), in particular the nucleus accumbens (NAcc) (Phillips et al., 1975), the striatum (Phillips et al., 1976) and the prefrontal cortex (Mora et al., 1976).

The area that has received most attention as the neural substrate of addiction is referred to as the mesolimbic pathway (see Figure 9.1). The mesolimbic pathway runs from the ventral tegmental area (VTA) to the NAcc. Destroying the mesolimbic pathway with a neurotoxin disrupted ICSS, especially when the electrodes were placed in the NAcc on the same side of the lesion (Fibiger et al., 1987; Phillips and Fibiger, 1978).

Of course, addicts do not self-administer electricity, they take drugs. As you can see in Research methods box 9.1, drug self-administration is an operant task in which an animal receives an infusion of a drug after pressing a lever.

Self-test: What is addiction?

Conditioned place preference (CPP) is a non-invasive method for assessing the reinforcing properties of a drug. CPP involves looking at drug-seeking behaviour. It does this by using secondary conditioning: a drug becomes associated with a particular environment (see Figure 9.2 and also Chapter 8). Previously neutral stimuli become associated with the drug. The drug is the UCS that

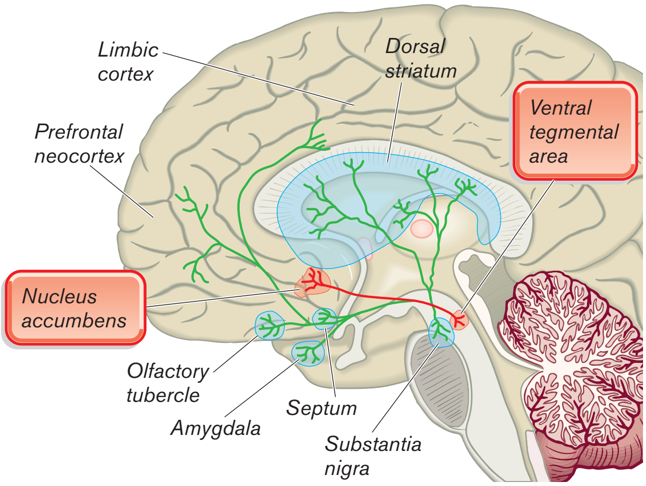

Figure 9.1 The mesolimbic pathway: activation of dopamine in this pathway, projecting from the ventral tegmental area to the nucleus accumbens, is thought to be the reason for addiction

RESEARCH METHODS BOX 9.1

Drug self-administration

Humans take drugs for recreational reasons. Animals, after training, will also take drugs. Using an operant chamber, a rat can press a lever that is contingent on drug delivery. The drug can be administered via an indwelling catheter, in water or directly to the brain. The drug in a self-administration procedure is the same as food reward in a standard operant experiment – the animal will work to receive a reinforcer.

If the drug is highly reinforcing, the animal will work hard to administer it. The drug can be made more expensive by using different schedules of reinforcement. The schedule of reinforcement is critical to establishing self-administration (Corrigal and Coen, 1989; Grasing et al., 2003).

There is a schedule of reinforcement that is commonly used in self-administration experiment: the progressive ratio (PR) schedule. The PR schedule requires the number of responses to be systematic, e.g. from FR1 to FR2 then FR4, FR8, FR16, FR32 and so on.

These schedules have been influential in determining how reinforcing a drug is. The point at which the animal stops lever-pressing is called the break point. If it progresses to a high break point (e.g. it has to press the lever 128 times for an infusion) the drug is said to be a more powerful reinforcer than a drug for which it will only press 36 times (e.g. Koob et al., 1987).

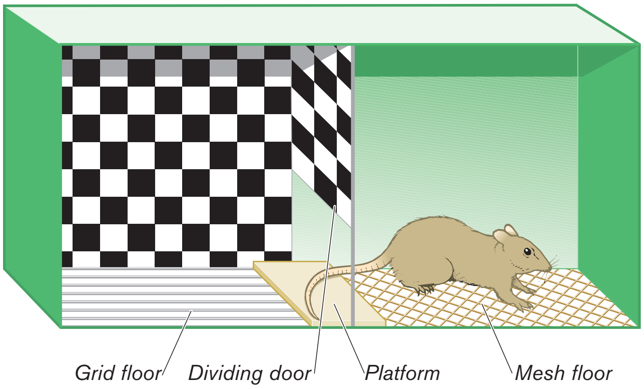

Figure 9.2 Typical conditioned place preference (CPP) apparatus as used in the experiments on nicotine

produces pleasurable effects (the UCR) and the environment in which it receives the drug becomes associated with the drug (CS). When tested drug free, the rat seeks out the drug-associated environment if it is reinforcing (CR).

Self-test: How would you assess the addictive nature of a drug?

Amphetamine and cocaine

Amphetamine and cocaine are psychostimulants that act on the dopaminergic system. Both enhance dopamine (DA) transmission. However, they do this in different ways (see Chapter 7). Generally speaking, amphetamine releases DA from the vesicles without the need for an action potential, whereas cocaine blocks reuptake and does require an action potential (Carboni et al., 1989b).

A number of studies have been conducted to determine the effects of cocaine and amphetamine on ICSS. Using a rate-free method, in which the rat presses a lever to obtain different frequencies of electrical stimulation, cocaine decreased the frequency administered by the rat (Maldonado-Irizarry et al., 1994). This is indicative of cocaine being a substitute for the rewarding properties of ICSS (i.e. the rat does not require as much electrical stimulation after cocaine).

Many experiments have verified that animals will self-administer cocaine and amphetamine (see Katz, 1989). Once established, a more detailed account of amphetamine and cocaine self-administration can be explored.

Roberts and Ranaldi (1995) pointed out that DA antagonists increase responding for cocaine and amphetamine. This is a compensatory mechanism; the animal lever presses even more to overcome the interruption of the drug effects. This is like the extinction burst in operant experiments.

Looking specifically at cocaine, we can see that its actions are mediated via postsynaptic DA receptors. There are two families of DA receptor: D1 and D2 (Kebabian and Calne, 1979). There are other receptors for DA and these can be classed according to the original categorisation.

One way of probing the receptor mechanisms of cocaine and amphetamine self-administration is to substitute them with more specifically targeted drugs. Woolverton et al. (1984) found that the D2 agonists maintained responding for cocaine or amphetamine in rhesus monkeys. In contrast, D1 agonists failed to maintain responding. The increased responding seen with D2 antagonists was not evident with D1 antagonists. Thus DA is important, but, more specifically, DA acting at the D2 receptor is important for drug self-administration.

If the NAcc and VTA are destroyed, cocaine and amphetamine responding stops in the rat (Roberts and Koob, 1982; Roberts et al., 1977). Furthermore, Koob (1987), using a PR schedule, demonstrated that lesions of NAcc decreased the number of drug infusions and an unwillingness to work for cocaine in rats. However, lesions of the NAcc are not a realistic treatment for addiction – after all, blockade of this area is achieved by a number of drugs that have not shown any therapeutic efficacy.

Both cocaine and amphetamine produce robust CPPs (e.g. Carr et al., 1989). The amphetamine-induced CPP can be blocked by DA antagonists (Leone and Di Chiara, 1987).

Lesions of the NAcc also produce a reduction in amphetamine-induced CPP (Spyraki et al., 1982).

Cocaine and amphetamine are both DA agonists and increase DA in the synapse. Their powerful addictive properties appear to be mediated by DA in the mesolimbic pathway.

Self-test: What are the neural pathways involved in addiction?

Nicotine

Nicotine is derived from tobacco, which is smoked, and there has been a great debate about its addictive properties (Stolerman and Jarvis, 1995). Nicotine is an agonist at nicotinic acetylcholine (ACh) receptors.

In the previous section, we made a case for cocaine and amphetamine mediating their addictive properties via mesolimbic DA. This is not too difficult to comprehend, as both drugs enhance DA directly. Nicotine acts at an ACh receptor, so how is it addictive if it does not act at DA directly?

Nicotine receptors can be found in the VTA and NAcc. A number of studies (e.g. Mirza et al., 1996) have shown that nicotine can also increase the levels of DA in the NAcc. These studies have used a technique called in vivo microdialysis, a method of obtaining sample fluid from the synapse in the functioning animal. The content of the fluid can then be analysed. Imperato et al. (1986) found that nicotine increased DA in the NAcc by 100% and also increased the levels of the DA metabolites DOPAC and HVA (an effect that was blocked by nicotine antagonists (Mifsud et al., 1989).

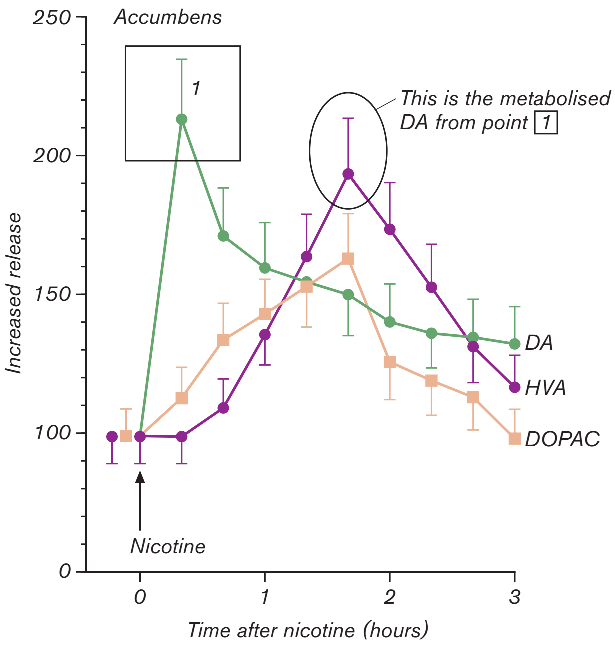

Figure 9.3 Nicotine increases DA and DA metabolites in the nucleus accumbens

Looking at Figure 9.3, you can see that nicotine increases the levels of DA very quickly, but these then diminish. As the levels of DA diminish, the metabolites of DA increase. This is indicative of DA being used and eliminated by metabolic enzymes (e.g. MAO). Thus the DA neurons in the NAcc have been very busy after nicotine administration. Nicotine's ability to increase DA from the NAcc is something it shares with many other addictive drugs (e.g. the opiates, such as heroin (Pontieri et al., 1996)).

Nicotine has been shown to affect ICSS (Clarke and Kumar, 1984). Like amphetamine and cocaine, nicotine lowered the frequency of ICSS, indicating its rewarding properties (Huston-Lyons and Kornetsky, 1992). However, some of the main reasons surrounding the scientific debate regarding nicotine's addictive qualities revolved around the experiments using nicotine self-administration.

Nicotine self-administration has been seen in primates (Goldberg et al., 1981) and, obviously, humans (Henningfield et al., 1983). Surprisingly, rats did not engage in nicotine self-administration. This was because the studies used a continuous reinforcement schedule, which produced low rates of responding. Thus the rat literature was not indicative of nicotine being a reinforcer.

Corrigall and Coen (1989) put rats on an FR5 schedule and found dose-dependent responding for nicotine. The schedule was critical to achieving nicotine self-administration. On a CRF and an FR2 schedule, responding was low (Donny et al., 1995; Donny et al., 2003); the rats needed to work harder for their reward so that a behaviour could be seen. Once obtained, nicotine antagonists blocked nicotine self-administration (Corrigall and Coen, 1989). As with cocaine and amphetamine, lesions of the NAcc also stopped nicotine self-administration (Corrigall et al., 1992). Thus, nicotine also appears to mediate its reinforcing and motivating properties via mesolimbic DA.

The addictive properties of nicotine have not been entirely supported by studies using CPP. Some studies have found a CPP with nicotine (e.g. Fudala et al., 1985), others have not (e.g. Chandler et al., 1995). The reason for this is unclear, but for the majority of cases it is a methodological issue. However, when a CPP was found with nicotine it could be blocked with both nicotine and DA antagonists (Carboni et al., 1989a; Iwamoto, 1990).

Nicotine acts at receptors for ACh, and increases DA in the mesolimbic pathway. Detailed studies have shown that its addictive properties are mediated in a similar pattern to that of cocaine and amphetamine. This action of nicotine is not unique; a number of other drugs that are addictive also increase mesolimbic DA, and this pathway is regarded as the common denominator of drug addiction (see Wise and Bozarth, 1987).

Self-test: Describe the similarities between nicotine and cocaine.

Giving up

Therapies for treating addiction are somewhat lacking in their effectiveness. However, a profitable industry surrounds giving up smoking, with strategies ranging from self-help and acupuncture to pharmacological assistance. Most forms of pharmacological help for smoking involve nicotine replacement. This comes in a number of forms: gum, patches and inhalators. They all involve replacing the cigarette and reducing the dose of nicotine over a period of time. Unfortunately, there is no quick fix or antidote to smoking.

Interestingly, there is a drug that bears no relation to nicotine that has been used to help treat smoking addiction. Zyban (bupropion), an antidepressant, is an agonist for noradrenaline. How does it work for nicotine addiction? It may work in three ways (Cryan et al., 2003):

1. by increasing brain reward mechanisms
2. by blocking nicotine's reinforcing properties
3. by reducing withdrawal.

LSD – the exception to the rule

It has been claimed that the common denominator of addictive drugs is the mesolimbic DA pathway (see Koob, 1992). However, there is a group of drugs that are not addictive, but misused. The psychedelics are typified by D-lysergic acid diethylamide (LSD), an extremely potent hallucinogen. LSD and other hallucinogens are not self-administered by animals. In fact, rhesus monkeys will press a lever to turn off a stimulus associated with LSD infusion (Hoffmeister and Wuttke, 1975). The reason for this is that LSD acts on serotonin and does not act in the mesolimbic pathway as do cocaine, amphetamine and nicotine. However, MDMA (ecstasy), a mixed DA and 5-HT drug, is self-administered (Fantegrossi et al., 2002; Schenk et al., 2003) and produces a CPP (Meyer et al., 2002), thus pointing to the role of DA in mediating these behaviours rather than serotonin.

In contrast, CPP experiments, LSD produces a conditioned place preference in the rat (Meehan and Schechter, 1998; Parker, 1996). Thus a CPP may be acquired without exclusive activation of the mesolimbic DA pathway.

Self-test: Why is LSD different from other consumed drugs?

Theories of addiction

Having established that there is a physiological basis for addiction – mesolimbic DA – these physiological accounts can be placed within a theoretical framework. The main theoretical positions are based on associative learning (see Chapter 8). However, there is increasing evidence to suggest a genetic predisposition (Uhl et al., 2002).

Positive reinforcement

We saw in Chapter 8 that a rat will press a lever to obtain a reinforcer. In drug self-administration experiments the drug is the reinforcer (see Katz, 1989). If there is a good outcome from the behaviour we are likely to engage in it again.

Physical dependence theories and negative reinforcement

Drugs clearly produce physiological effects. With positive reinforcement this may be getting high. However, drugs often have side-effects – that is, the absence of the drug produces physical reactions in the body, known as withdrawal symptoms. Given the extremely unpleasant nature of withdrawal symptoms the addict is compelled to alleviate them by continuing to take the drug. Therefore drug-taking behaviour is maintained by negative reinforcement: a response (drug taking) stops a negative consequence (withdrawal symptoms). However, a person can become addicted without exhibiting physical dependence and therefore the theory is inadequate to explain all cases of addiction.

Self-test: Are drugs positive or negative reinforcers?

Sensitisation of incentive salience

With continuing exposure to a drug, there is a heightened responsiveness to subsequent drug administrations – basically, there is a bigger effect (this is called *sensitisation*).

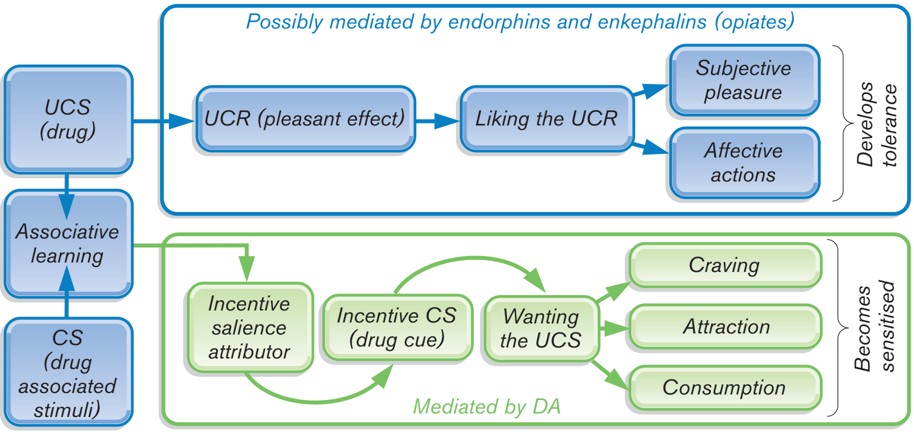

Figure 9.4 Sensitisation of incentive salience: the wanting of a drug becomes sensitised and, through conditioning stimuli that are associated with the drug, promotes craving; the liking of the drug does not sensitise and develops tolerance
Source: adapted from Robinson and Berridge (1993)

This is an effect that mesolimbic DA may mediate (e.g. Kalivas and Weber, 1988; Kolta et al., 1989).

Wise and Bozarth (1987) presented a view that the common denominator of reinforcing drugs is their psychomotor stimulant properties, which are mediated via mesolimbic DA.

Robinson and Berridge's theory (Berridge and Robinson, 2003; Robinson and Berridge, 1993, 2000) has integrated learning and the physiological action of drugs: the incentive–sensitisation theory of addiction. In this theory, there are three major features of addiction (see Figure 9.4):

1. There is craving for the drug.
2. he drug craving is persistent and can reappear after abstinence.
3. As the craving for the drug increases (the wanting of the drug), the pleasure obtained from it decreases (the liking).

The process of drug taking leads to sensitisation of physiological and behavioural measures. The neural system that is sensitised is hypothesised to mediate a psychological function involved in incentive motivation. In the addict, the drug becomes a highly motivating reinforcer and is given incentive salience – the wanting of the drug. Sensitisation, then, enhances incentive salience. Incentive salience is a motivational state, which turns stimuli into desired must-have objects (or drugs).

The theory continues to state that, via conditioning, drug and associated stimuli become more salient. Thus stimuli that are associated with the drug (e.g. drug paraphernalia, such as the syringe with intravenous heroin use) become able to control behaviour – that is, induce the wanting of the drug. This increase in wanting the drug is due to the neural substrate and the associative learning to it becoming more sensitised. The bad news is that repeated exposure only sensitises the wanting not the liking. The pleasure derived from the drug is mediated by another system, perhaps an opiate system (see the interview with Berridge in Phillips, 2003) and is subject to tolerance.

Sensitisation remains for a long period of time, even after the drug taking has stopped; it may even be permanent. It is this that can lead to the reinstatement of drug taking (somewhat like spontaneous recovery). Because of the conditioning of drug-related stimuli to the drug, the drug-related stimuli can precipitate relapse. Anecdotal accounts from detoxified drug users have indicated that returning to the drug-taking environment can lead to relapse.

While the theory has generated a great deal of interest and debate, it does not hold out the prospect of an optimistic future for the drug addict. But of all the therapies available, cognitive-behavioural therapy is necessary to reduce the problem (Robinson and Berridge, 2000).

Self-test: Explain the main theories of addiction.

Brain mechanisms for eating

The brain is in control of feeding behaviour, not just the mouth and stomach. The brain's role in feeding has been through a number of adaptations that demonstrate the benefits of hindsight and the advantages of modern technology.

The hypothalamus

The hypothalamus has been the main focus of attention regarding feeding behaviour, in particular the lateral hypothalamus (LH) and the ventromedial hypothalamus (VMH) (see Figure 9.5). The LH is regarded as the hunger centre and the VMH the satiety centre. Satiety is the motivational state that terminates feeding. When the LH is

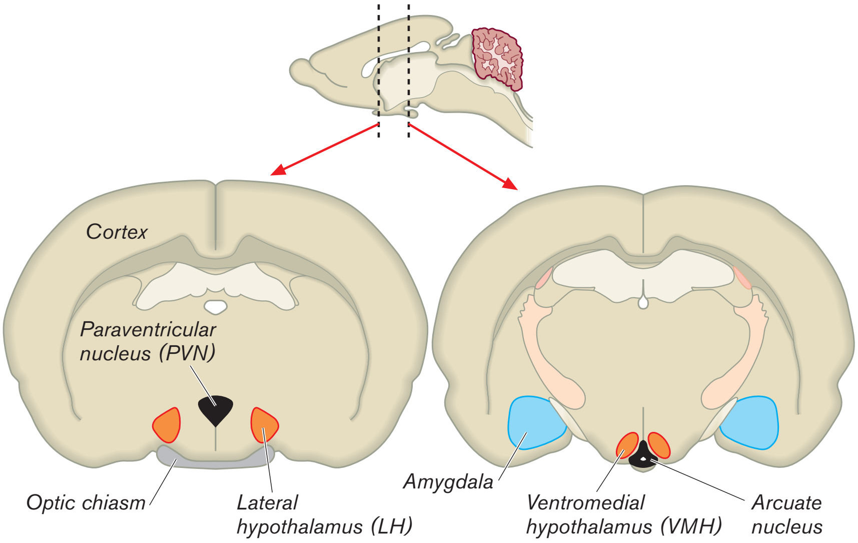
Cortex
Paraventricular nucleus (PVN)
Optic chiasm
Lateral hypothalamus (LH)
Amygdala
Ventromedial hypothalamus (VMH)
Arcuate nucleus

Figure 9.5 The hypothalamic nuclei involved in eating

stimulated, the state of hunger is induced and eating commences. The LH is under the inhibitory control of the VMH. There are receptors for glucose, called glucoreceptors, in the VMH, and when glucose is low the LH is released from inhibition by the VMH. Conversely, when glucose concentrations are high the VMH inhibits the LH. Glucose is a simple type of sugar and provides energy for cells.

This hypothesis was derived from rat studies. Lesions of the LH produced aphagia in rats: they stopped eating (Anand and Brobeck, 1951). The aphagia was accompanied by adipsia (they stopped drinking); the animal could recover from both conditions with intensive care (Teitelbaum and Stellar, 1954).

Lesions of the VMH led to hyperphagia (overeating) (Hetherington and Ranson, 1940). There were two phases of hyperphagia: the dynamic phase and the static phase. The dynamic phase, during which the rats gained the most weight, was immediately after surgery. During the following static phase, they ate enough to maintain obesity.

Self-test: What are the main regions of the hypothalamus?

A reappraisal of the literature calls into question the role of the hypothalamus. Unfortunately, but not surprisingly, the hypothalamus as the control centre of feeding is an oversimplification. Lesions of both the LH and VMH have behavioural consequences other than altering the regulation of feeding per se.

Lesions of the LH produce non-specific deficits, most notably deterioration of motor behaviour. The hypothalamus is a region with both intrinsic nuclei and neurons that pass through without synaptic contact. The nigrostriatal pathway is also lesioned during LH destruction.

Lesions of the nigrostriatal pathway can lead to extreme motor problems; after all, Parkinson's disease is a result of degeneration of this pathway. Selective lesions of the nigrostriatal pathway also induce aphagia (Marshall et al., 1974).

Does this mean the LH has no role in feeding behaviour? More recent studies also point to a role for the LH. In the monkey, neurons of the LH fire in response to the sight of food (Burton et al., 1976). Lesions with ibotenic acid selectively destroy the LH, while leaving the nigrostriatal pathway intact, and produce aphasia (e.g. (Dunnett et al., 1985)). Ibotenic acid is a neurotoxic agent that acts on glutamatergic neurons. Glutamate in the LH produces eating (Stanley et al., 1993), whereas antagonists decrease eating (Stanley et al., 1996). Thus, the hypothalamus remains an area of key interest, but the attention is now diverted to the role of various chemicals in LH.

Self-test: Explain the reasons why the hypothalamus was originally considered a feeding centre.

There are two neuropeptides that are released by the LH (and glutamate in the LH) that affect feeding: melanin-concentrating hormone (MCH) and orexin. Both of these induce eating and when the animal is deprived of food there is an increase in mRNA levels to make MCH and orexin (Dube et al., 1999; Qu et al., 1996; Sakurai et al., 1998).

Neuropeptide Y (NPY) is a potent stimulator of food intake (Clark et al., 1984), and activates MCH and orexin (Broberger et al., 1998; Elias et al., 1998). When leptin (a hormone released by fat tissue) is released, it inhibits NPY, reducing feeding (Wang et al., 1997). Injection of NPY into the LH makes rats eat under aversive conditions (Flood and Morley, 1991; Jewett et al., 1992). NPY in the paraventricular nucleus (PVN) of the hypothalamus increases insulin levels (Stanley et al., 1993)), and inhibition of NPY synthesis suppresses feeding and insulin (Akabayashi et al., 1994). Food deprivation increases NPY and eating (Sahu et al., 1988), an effect that can be blocked by NPY antagonism (Myers et al., 1995). Deprivation of glucose leads to activation of NPY in the arcuate nucleus that projects to PVN (Minami et al., 1995) and therefore increases insulin. Insulin is a pancreatic hormone that:

1. aids the entry of glucose into the cell
2. aids the conversions of glucose into glycogen (stored glucose) and fat and amino acids into proteins (all of which can be stored)
3. promotes storage of the converted nutrients. NPY thus promotes hunger and preserves energy stores.

The actions of NPY on feeding make it clear that the hypothalamus is still an important structure.

Lesions of the VMH result in more than a loss of inhibitory control of eating. Rats will not eat food that is made bitter – they become fussy eaters (Ferguson and Keesey, 1975). VMH lesions cause an increase in the parasympathetic activity of the vagus nerve, which stimulates insulin secretion and inhibits glucogon (Weingarten et al., 1985). Glucogon is a pancreatic hormone that converts stored glycogen back into glucose. VMH lesions increase insulin levels, promoting storage and therefore body fat production. VMH lesions also decrease the breakdown of fat for utilisation. Therefore, most of the energy is derived from the absorption of nutrients and not from the release of stored nutrients. If the vagus nerve is cut, thereby blocking communication between brain and pancreas, the effects of the VMH lesion are negated.

There are also anatomical consequences of VMH lesions. In VMH lesions, axons are destroyed that connect the PVN (and its functions) to other brain stem structures, e.g. the ventral noradrenergic bundle (Gold et al., 1977).

Serotonin (5-HT) in the VMH and PVN leads to an inhibition of eating (Leibowitz et al., 1990). Food intake is increased by 5-HT destruction (Saller and Stricker, 1976), inhibition of 5-HT synthesis (Breisch et al., 1976) or 5-HT receptor blockade (Stallone and Nicolaidis, 1989). Serotonergic antagonism increases NPY secretion, which in

ACTIVITY BOX 9.3

Why do we overeat?

It cannot have escaped your notice that regular reports in the media claim we are becoming an overweight nation. In nutritional terms we are eating more than we require.

Why are we eating more? Try to think of all the explanations that could account for this increase in food intake.

I would imagine at the top of your list is the type of food we consume. People are eating more fatty foods, etc. Then there is taste. People eat more because they like the taste. A quick look around any supermarket will show you the rich variety of tastes present from around the world.

However, there are other features that can increase food intake, for example:

- smell – the smell of freshly baked bread is often enough to make people feel hungry
- visual appeal – we often 'eat with our eyes'; presentation of food can make people eat more
- variety – the increased variety of foods available can make people eat more; something as simple as the variety of colours in Smarties can make you rate the pleasantness of the sweet higher than if there were just one colour (Rolls et al., 1982).

turn leads to increased food intake (Dryden et al., 1995). Drugs that increase 5-HT can be used for obesity.

Eating disorders

There are three main eating disorders: obesity, anorexia nervosa and bulimia nervosa. (For a more detailed account of the physiological factors involved in eating disorders, see Chapter 33.)

Obesity

The media love to print stories about an increasingly obese nation and the diet industry is extremely profitable. Even with our current understanding of feeding, the pharmaceutical industry has yet to deliver a drug alternative to the diet. Part of the problem in treating obesity is a lack of understanding surrounding the aetiology and pathogenesis of this behaviour. There are many reasons why someone may be obese, ranging from hormonal through to genetic and behavioural (see Activity box 9.3). Some drugs have been used (such as fenfluramine, which is a 5-HT agonist), but side-effects tend to make this limited (Blundell and Halford, 1998).

Anorexia nervosa

A person with anorexia nervosa restricts her food intake, which leads to a dramatic decline in weight. Anorexia nervosa, like obesity, has had several theories associated with it. Again, there is little pharmacological help at hand for the patient with anorexia nervosa (see Chapter 33).

Bulimia nervosa

Patients with bulimia nervosa binge eat and then vomit or use laxatives to control their weight. Fluoxetine (Prozac) is a 5-HT agonist that has been used to treat bulimia nervosa (Kaye et al., 2001). This is contradictory to the actions of serotonergic drugs in the PVN. However, those who suffer with bulimia nervosa also suffer depression. Fluoxetine is an antidepressant and it may be that once the depression is treated the eating disorder improves.

This highlights an important point in all disorders, not just eating disorders. The symptoms of eating disorders are focused on food intake. Food intake may be a secondary symptom of a psychiatric/psychological disorder (depression), rather than a primary symptom of an eating disorder in its own right (see Chapter 33).

Self-test: What does neuropeptide Y do?

Drinking and thirst

The entertainer David Blaine was willing to go without food for 44 days but not water during September/October 2003. The consequences of not eating for this period of time are unpleasant but not necessarily life threatening. To go without water is far more serious.

We have two fluid-filled compartments in the body: there is intracellular fluid (in the cytoplasm) and extracellular fluid, which includes intravascular fluid (blood plasma), interstitial fluid (between the cells) and cerebrospinal fluid (CSF). The body needs to regulate these fluid compartments (see Rosenzweig et al., 2002). There is movement between the fluid compartments that allow cells to survive. The extracellular fluid acts in a supporting role to the cells and is controlled by brain mechanisms that monitor its levels.

The brain does this by promoting thirst as the motivator for drinking. There are two types of thirst: osmotic thirst and hypovolemic thirst. Osmotic thirst occurs when the solute concentration of extracellular fluid increases (it becomes more salty) and takes water from the intracellular fluid (which may place the cells in danger of damage). Basically, salty food changes the constituents of the fluid. Such food increases thirst and that's why some pubs and bars serve free salted peanuts as these enhance the fluid intake of their customers. Osmoreceptors, perhaps located in the anterior hypothalamus and other areas, detect changes in the concentration of the interstitial fluid.

Hypovolemic thirst occurs when the intravascular fluid decreases. A loss of blood volume is detected by baroreceptors, which detect blood pressure, and also by receptors in the kidneys. The kidneys secrete renin at times of low blood flow.

Renin aids the production of angiotensin, a hormone that increases drinking (Epstein et al., 1970). Angiotensin activates two other hormones: aldosterone and vasopressin. Aldosterone retains salt and water, plus it constricts the blood vessels. Vasopressin (or antidiuretic hormone) reduces the amount of fluid going to the bladder. Vasopressin conserves water, whereas aldosterone conserves salt until more is consumed.

Self-test: Describe the difference between osmotic and hypovolemic thirst.

Brain mechanisms in thirst

Signals from the baroreceptors located in the heart are sent to the nucleus of the solitary tract (in the medulla). Angiotensisin levels are detected by neurons projecting to the subfornical organ. The subfornical organ communicates with the median preoptic nucleus (MPN). According to Thrasher et al. (1989) the MPN integrates hypovolemic and osmotic signals. The MPN is therefore instrumental in initiating drinking behaviour.

Self-test: Describe the main features of drinking.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the main theories of addiction.
2. Describe the physiological bases of drug addiction.
3. Evaluate the hypothalamus as a site of feeding.
4. Describe the mechanisms underlying drinking.

Further reading

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Essay titles and references

1 Explain how different drugs all have something in common and in common with other reinforcers.

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2 To what extent do drugs simply activate dopamine (DA) for them to become addictive?

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Robinson, T. E. and Berridge, K. C. (2003) Addiction, *Annual Review of Psychology*, 54, 25–53.

3 How can psychobiology accounts of feeding inform drug treatment for eating disorders?

Beck, B. (2006) Neuropeptide Y in normal eating and in genetic and dietary-induced obesity, *Philosophical Transcriptions of the Royal Society London – B Biological Science*, 361(1471), 1159–85.
Goldstone, A. P. (2006) The hypothalamus, hormones, and hunger: Alterations in human obesity and illness, *Progress in Brain Research*, 153, 57–73.
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Web links

Eating Disorder Unit at the Institute of Psychiatry:
http://web1.iop.kcl.ac.uk/iop/Departments/PsychMed/EDU/index.shtml

National Addiction Centre: http://web1.iop.kcl.ac.uk/IoP/Departments/-PsychMed/NAC/new.shtml

National Institute on Drug Abuse: http://www.nida.nih.gov/

10

Emotion and sleep

Route map

Our emotions make life a colourful experience. This chapter investigates the neural mechanisms that underlie our emotions – for example, the amygdala and fear. It also investigates the neural mechanisms of sleep.

Introduction

If emotion is a heightened state of consciousness, sleep is a lowered state of consciousness. We spend a large proportion of our life asleep. The brain is also responsible for sleep. Changes in sleep can have serious ramifications for other behaviours, and sleep disorders can be debilitating.

Emotion

What is emotion? We all have an idea of what love, anger, fear etc. are (see Activity box 10.1). Emotions are complex experiences that involve cognition, affect and physiology. What happens when we are confronted by a fierce animal or a violent and aggressive human, for example? The cognitive part of the emotion identifies the stimulus as fierce bear. The affective component of the emotion produces the feeling of fear and the physiological response is the activation of the sympathetic nervous system. This gets us ready for fight or flight.

ACTIVITY BOX 10.1

How many emotions can you name?

Much of the research into the biological basis of emotion has focused on fear. Clearly we experience more than fear.

How many emotions can you name?

Figure 10.1 shows a list compiled by Fischer et al. (1990) in a hierarchy.

How do you know that someone is experiencing one of these emotions?

Apart from verbal communication we are able to tell the emotional state of an individual by their facial expression. The facial expression is a relatively cross-cultural display of emotion (Russel, 1994).

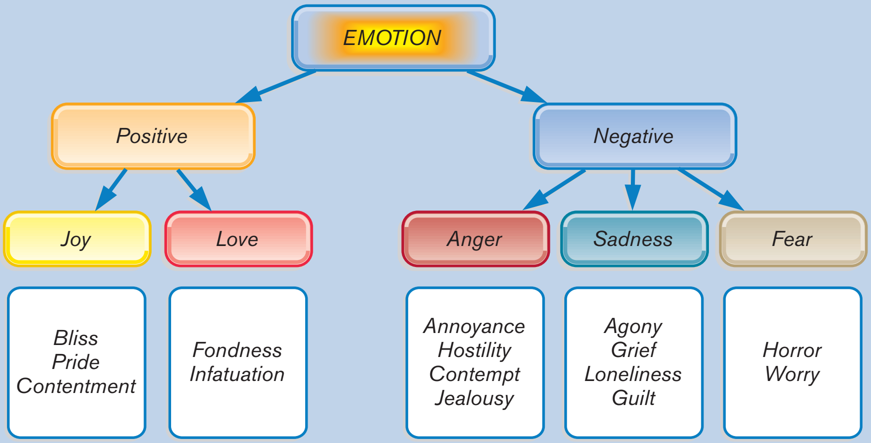


Figure 10.1 Emotions can be placed into different categories

There have been a number of theories proposed to account for emotions. A full discussion of these can be found in Chapter 26, but all these theories have involved a physiological component.

Given that emotion is a cross-cultural phenomenon and that the expression of emotions via the somatic nervous system is also universal, this chapter will focus on the neural mechanisms that underlie emotion.

Self-test: What are the main emotions?

Physiological/psychological theories of emotion.

Theories of emotion have tried to integrate both psychology and physiology (see Chapter 26).

William James (1842–1910) and Carl Lange (1834–1900) both had a similar view on emotions. The theory that was to become known as the James–Lange theory is depicted in Figure 10.2. Essentially, an emotionally salient stimulus is perceived (e.g. an aggressive male or, if you read certain newspapers, a teenager in a hooded top), this leads to a set of physiological responses (e.g. increase in heart rate) that then determine the emotion experienced (e.g. fear).

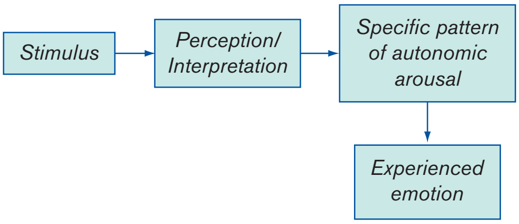
Criticisms of the James–Lange theory provoked an alternative by Walter Canon and Philip Bard. The Canon–Bard theory uses the same 'boxes' as the James–Lange theory, but after the perception of the emotionally salient stimulus both a physiological reaction and an emotional reaction occur simultaneously. This has clear implications for survival and can be seen as having an evolutionary advantage by increasing the speed of the fight or flight response. The physiological change can adjust the intensity of the emotion felt, but not the affect.

There are a number of objections to this account: (1) The physiological feedback is not distinct enough to determine individual emotions. (2) Imagined stimuli produce emotions, but have a reduced physiological reaction. (3) Interruption of physiological feedback (e.g. after spinal injury) does not prevent emotions being experienced. (4) Psychopharmacological manipulations of the ANS do not produce emotions and blockade does not prevent emotions being experienced.

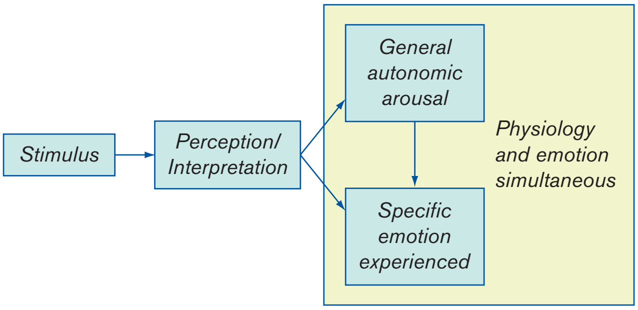
Putting a contextual element or cognitive appraisal to emotional responses was demonstrated by a set of classic psychology experiments (Schachter and Singer, 1962). (For details see Research methods box 10.1.) This experiment demonstrated that the emotions experienced by the participants are a product of the interpretation of the environment and physiological arousal.

All the theories of emotion have encompassed some bodily changes, but the emphasis was on processes and experience. They did not dwell on the involvement of the brain or brain regions involved.

(a) James–Lange Theory


Stimulus
Perception/ Interpretation
Specific pattern of autonomic arousal
Experienced emotion

(b) Cannon–Bard theory


Stimulus
Perception/ Interpretation
General autonomic arousal
Specific emotion experienced
Physiology and emotion simultaneous

(c) Cognitive appraisal

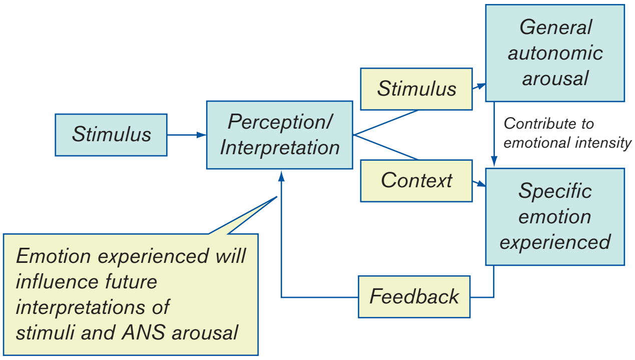

Stimulus
Perception/ Interpretation
Stimulus
Context
General autonomic arousal
Contribute to emotional intensity
Specific emotion experienced
Feedback
Emotion experienced will influence future interpretations of stimuli and ANS arousal

Figure 10.2 Theories of emotion

RESEARCH METHODS BOX 10.1

Cognitive, social and physiological determinants of emotional states

The hypotheses of this study was essentially as follows:

- Cognitive factors will determine emotional states. Physiological arousal could lead to either happiness or anger depending on the context.
- If the physiological arousal experienced has a clear explanation, then there will not be the attribution of that arousal to a context or stimulus.

- With the same cognitive input emotions will be described in accordance with physiological arousal.

To do this, Schachter and Singer manipulated three variables:

1. physiological arousal
2. information about physiological arousal
3. an environment in which different explanatory cognitions could be derived.

Participants were told that the study was to investigate the effects of a vitamin on vision – a case of deception! To change physiological arousal participants received an injection of adrenaline (although they were told it was a vitamin called Suproxin) or a placebo. Adrenaline increase blood pressure and increases heart rate etc. – all signs of physiological arousal. Furthermore, some participants were informed, misinformed or not informed of the effects of adrenaline.

To provide a cognitive explanation of the arousal the environment was manipulated with the aid of an experimental collaborator or stooge (who was thought by the participants to be in the same position as they were). The stooge creates either a euphoric context or an anger-inducing context by acting accordingly.

Thus, in these experiments, there were 7 conditions:

1. a group given adrenaline and told of the effects (euphoria condition)
2. a group given adrenaline, but not informed (euphoria condition)
3. a group given adrenaline and misinformed (euphoria condition)
4. a placebo group (euphoria condition)
5. a group given adrenaline and told of the effects (anger condition)
6. a group given adrenaline, but not informed (anger condition)
7. a placebo group (anger condition).

What they found was the groups that were informed about the drug were able to attribute the changes to the drug treatment. Those who were not provided information labelled the change in terms of the cognitions available to them, either angry or euphoric. In the placebo conditions, the level of emotion experienced was related to physiological arousal.

The emotional brain

The theories of emotion have included physiological responses, but they have not provided a detailed account of the neural circuitry involved in emotion. Papez in 1937 (see Papez, 1995) considered the limbic system to be involved in the emotional experience, and the neural mechanism of emotion has since come to be known as the Papez circuit.

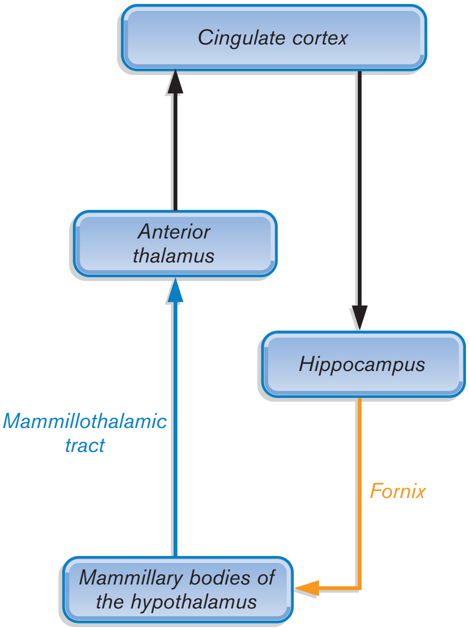


Figure 10.3 The Papez circuit

Papez circuit

The initial proposal by Papez was a neural circuit for the expression of emotion. This involved the connection of the cingulate cortex and the hypothalamus. The hypothalamus is connected via the mammillary bodies of the hypothalamus to the anterior nucleus of the thalamus, which then projects to the cingulate cortex. Information from the cingulate cortex projects to the hippocampus and back to the hypothalamus via the fornix (see Figure 10.3).

After lesions of the medial temporal lobe, monkeys demonstrated a set of behaviours that became known as Klüver–Bucy syndrome (Klüver and Bucy, 1938). There are many behavioural consequences of such a lesion, but in the context of emotion, these monkeys did not demonstrate fear or hostility to humans. They were placid or tamed. The changes in the monkeys' emotional output were considered to be a result of disruption to the Papez circuit.

With subsequent neuroanatomical investigation, other areas of the brain have been implicated, in particular the amygdala. The reduced fear response in Klüver–Bucy syndrome can be accounted for by lesions, specifically to the amygdala.

Self-test: Describe the Klüver-Bucy syndrome.

The amygdala

The amygdala is not one set of nuclei, but rather a complex of different regions (see Figure 10.4) and these different regions have different neuroanatomical connections. The medial nucleus receives input from the olfactory cortex and olfactory bulb. The basolateral nuclei receive input from the cortex, thalamus and hippocampus. The central nucleus receives input from the basolateral nuclei.

The amygdala is the convergence point for the integration of cortical and subcortical information.

The amygdala and fear

The central nucleus projects to a diverse set of brain regions (see Figure 10.5). Unilateral removal of the amygdala in split-brain monkeys revealed the importance of this region (Downer, 1961). By cutting the communication of the hemispheres, stimuli presented to one eye could not be passed to the other hemisphere. Stimuli that would normally provoke an emotional reaction did not if they were presented to the side with the lesion of the amygdala. If the stimuli were presented to the intact side then an emotional response was seen.

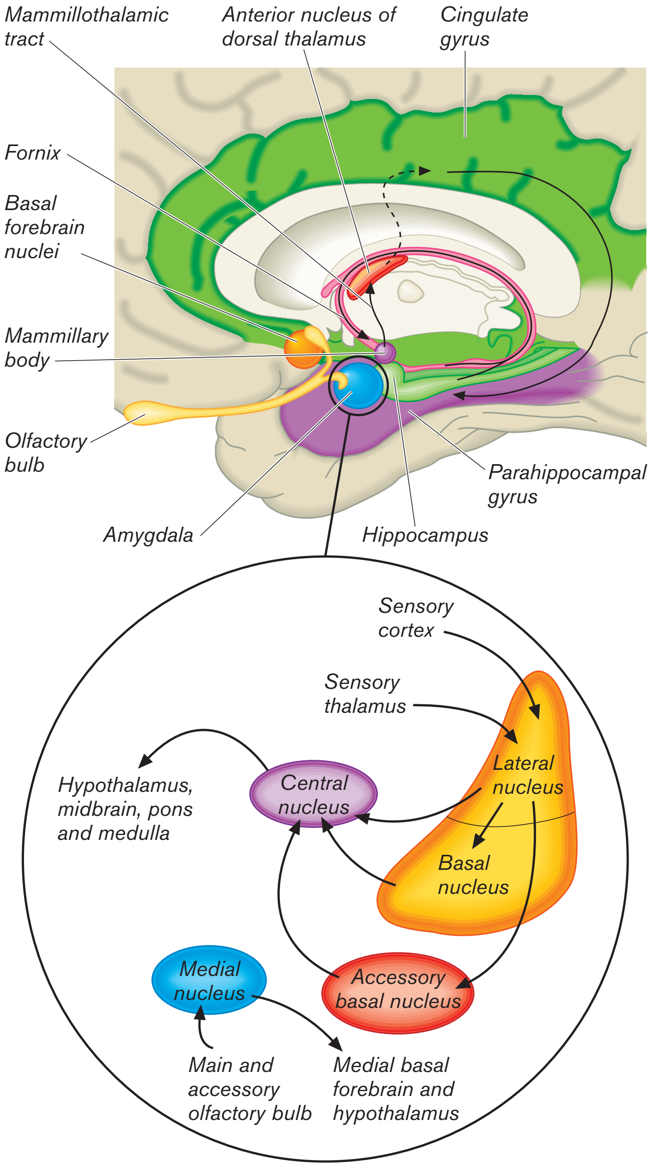

Mammillothalamic tract
Anterior nucleus of dorsal thalamus
Cingulate gyrus
Fornix
Basal forebrain nuclei
Mammillary body
Olfactory bulb
Parahippocampal gyrus
Amygdala
Hippocampus
Sensory cortex
Sensory thalamus
Hypothalamus, midbrain, pons and medulla
Central nucleus
Lateral nucleus
Basal nucleus
Medial nucleus
Accessory basal nucleus
Main and accessory olfactory bulb
Medial basal forebrain and hypothalamus

Figure 10.4 The nuclei of the amygdala

One emotion that is very well studied is fear. Fear can be produced under controlled experimental conditions in animals and therefore experiments can be performed that could otherwise not be undertaken in humans (LeDoux, 1998). Fear responses can be learned by animals (see the section in Chapter 8 on the conditioned emotional response (CER)). Using conditioning procedures to induce fear to an auditory stimulus, LeDoux's laboratory has been able to study the role of the amygdala. By systematically lesioning pathways within the brain that process auditory signals, the pathway that mediates the fear response can be traced. Lesions of the central amygdala prevent a CER developing, whereas lesions connecting cortical processing have no effect (LeDoux et al., 1988). Conversely, when the amygdala is stimulated, animals show signs of fear and agitation (see Davis, 1992).

The lack of CER after damage to the amygdala can also be seen in humans (LaBar et al., 1995). Blood flow to the amygdala is increased when a cue that is associated with an aversive stimulus is presented (LaBar et al., 1998). Studies using fMRI have shown that the amygdala is activated in response to fearful faces (Phillips et al., 1998) and during fear conditioning (Cheng et al., 2003). Lesions of the amygdala prevent negative facial expressions being rated as less favourable than positive facial expressions (Adolphs et al., 1998) and patients with lesions of the amygdala are impaired at recognising the emotional content of complex social scenes only when there is facial expression; they are not affected when the faces are erased (Adolphs and Tranel, 2003).

PET scans have revealed activation of the amygdala when participants have to recall the content of emotionally loaded films compared to neutral films (Cahill et al., 1996) or are shown threatening words (Isenberg et al., 1999). The experimental evidence supports a central role of the amygdala in emotion.

Despite the evidence for the role of the amygdala in negative emotions, such as fear, there is evidence to suggest that the earlier findings stating a reduction in amygdala activity in positive emotion is an artefact of experimental methodology (Zald, 2003). While the activation of the amygdala is seen with input from many sensory modalities, it is also involved in preparatory responses that make up the flight or fight response (Cheng et al., 2006; Knight et al., 2005; Yaniv et al., 2004).

Self-test: What is the contribution of the amygdala to emotion?

The hippocampus and fear

Many people feel fear when entering a hospital. If you have to attend a hospital for negative reasons, the hospital may become associated with fear. LeDoux (1998) has included the hippocampus as an area that is responsible for the conditioning of contextual fear. Lesions of the hippocampus prevent contextual fear conditioning. If the lesions are

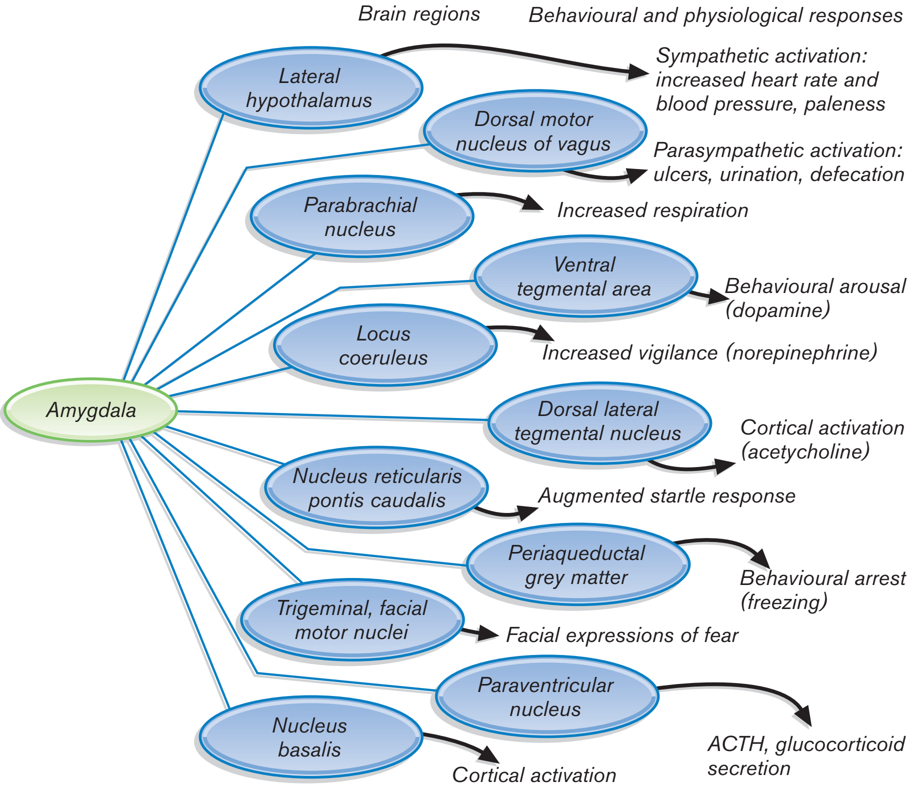

Brain regions
Behavioural and physiological responses
Lateral hypothalamus
Sympathetic activation: increased heart rate and blood pressure, paleness
Dorsal motor nucleus of vagus
Parasympathetic activation: ulcers, urination, defecation
Parabrachial nucleus
Increased respiration
Ventral tegmental area
Behavioural arousal (dopamine)
Locus coeruleus
Increased vigilance (norepinephrine)
Amygdala
Dorsal lateral tegmental nucleus
Cortical activation (acetycholine)
Nucleus reticularis pontis caudalis
Augmented startle response
Periaqueductal grey matter
Behavioural arrest (freezing)
Trigeminal, facial motor nuclei
Facial expressions of fear
Paraventricular nucleus
ACTH, glucocorticoid secretion
Nucleus basalis
Cortical activation

Figure 10.5 The connections of the amygdala

performed after conditioning, it is only the fear response to the context that is blocked. The hippocampus provides the memory for previous events and experiences (LeDoux, 1998) (see Figure 10.6).

Self-test:

- Describe the connections of the amygdala.
- What is the role of the hippocampus in emotion?

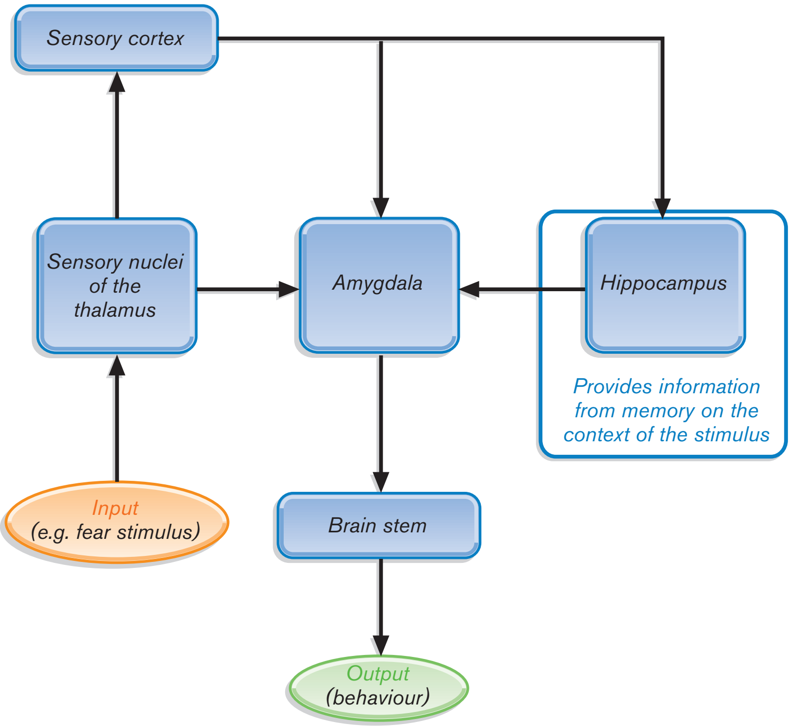

Sensory cortex
Sensory nuclei of the thalamus
Amygdala
Hippocampus
Provides information from memory on the context of the stimulus
Input (e.g. fear stimulus)
Brain stem
Output (behaviour)

Figure 10.6 A neural circuit of fear, including the involvement of the hippocampus

Beyond fear

The relative ease with which fear can be produced in humans and non-humans has meant that this emotion has been the main focus of attention for researchers, and other emotions have not been as well studied. After all, the measurement of positive emotions in animals requires a behavioural output. How do we assess if the rat is happy etc? This is a question that has occupied psychobiologists in an attempt to elucidate other emotions. It has been suggested that the ultrasonic vocalisations of rats (at 50 kHz) are indicative of social joy (Burgdorf and Panksepp, 2006; Panksepp, 2007). The future of this line of investigation may provide valuable insight into the neuroscience of other emotions.

Bartels and Zeki (2000) investigated the brain activation of people who claimed to be in love. When looking at pictures of their loved ones, there was an increase of activity in the anterior cingulate cortex and the striatum. This was accompanied by a reduction of activity in the amygdala. In more recent studies, love has been associated by activation of brain reward mechanisms (Aron et al., 2005; Bartels and Zeki, 2004) questioning it as an emotion but more a motivation akin to positive reinforcers and aids the continuation of the species (Esch and Stefano, 2005). Not surprisingly, the subject of a neuroanatomical site has provoked some degree of philosophical debate about the use of brain imaging and the definitions of constructs such as love (Fusar-Poli and Broome, 2006, 2007) – after all what is love?

Rolls's account of emotion focuses on brain regions such as the orbitofrontal cortex. He suggests that: '[E]motions are states elicited by rewards and punishers, that is, by instrumental reinforcers' (Rolls, 2005: 11). Thus the different emotions are evoked by different reinforcement contingencies (see Figure 10.7). Thus Rolls's account of emotion fits with Bartels and Zeki's studies on love suggesting a motivational network and with the role of dopamine in fear conditioning (Pezze and Feldon, 2004).

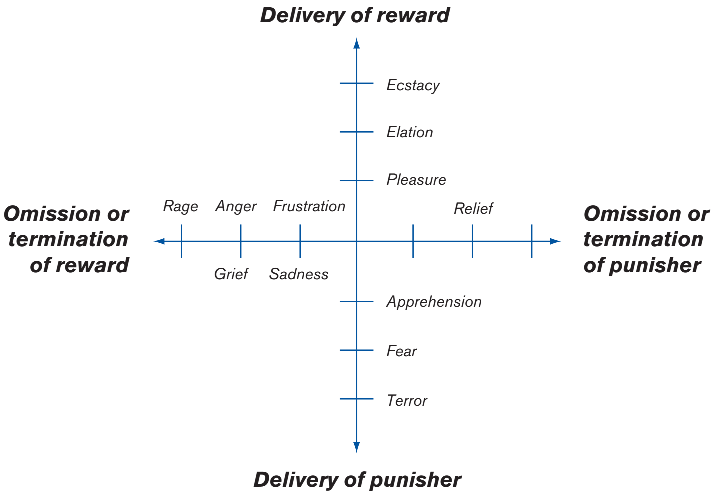


Figure 10.7 Rolls's theory of emotion

Damasio et al. (2000) investigated the recall of happiness, sadness, anger and fear and the number of brain regions that were activated during emotional experience differed from emotion to emotion. So emotion is much more than amygdala activation seen with fear conditioning.

Self-test: Do animals express emotions?

Aggression

Aggressive behaviour is a subject of great concern for many branches of our society and the male of the species has been studied at great length to understand aggression and violence.

Neural mechanisms and aggression

In animal studies, the amygdala and hypothalamus have been shown to influence defence behaviours and attack behaviours (see Siegel et al., 1999). The amygdala was activated in the brains of convicted murderers whose crime was impulsive and not premeditated, whereas those who were guilty of premeditated murder exhibited greater prefrontal activity (Raine et al., 1997; Raine et al., 1998).

Research suggests that the job of the prefrontal cortex is inhibiting the amygdala's response (see Carlson, 2004). As the executive controlling mechanism of the brain, the frontal areas are involved in initiating, planning and the execution of behaviours. The frontal lobes would have access to an account of the implications of our actions and thus suppress them if necessary (see Shallice, 1988).

Hormones and aggression

It is predominantly males who display aggression, and this has given rise to evolutionary and hormonal explanations for this behaviour.

The male hormones (in particular, the androgens such as testosterone) have been held responsible for male aggression and, consistent with this belief, castration in rats reduces aggression, while testosterone treatment reinstates it (Beeman, 1947). Early exposure to androgens during the organisational period of the brain's development results in less androgen being required to produce an aggressive response later in life (vom Saal, 1983).

Research into human aggression has not been entirely conclusive. Methodological limitations, such as the fact that you may not castrate men, means that many experimental manipulations are not permitted. This leaves us with correlation studies. These have looked at the circulating levels of androgens and attempted to map them with behaviour. The overall view is that there is a possibility that androgens are involved in human male aggression (Albert et al., 1993).

Stress

How many times have you heard someone say that they are 'stressed out'? Do you feel stressed when confronted with exams? There are many events that can lead to stress (see Chapter 35). Stress is big business: whether it is litigation after the event or prevention of its occurrence.

From a psychobiological point of view, stress is the reaction to the perception of an aversive stimulus and automatic responses initiated by the amygdala. The amygdala releases corticotrophin-releasing hormone (CRH), which activates the autonomic and endocrine systems. The activation of these systems mobilises energy for a fight or flight response. Activation of the SNS produces a release of adrenaline, noradrenaline (NA) and stress hormones.

Adrenaline interferes with glucose, allowing more energy to be released and adrenaline and NA increase blood flow and heart rate.

The stress hormone, a glucocorticoid called cortisol, is released by the adrenal gland, and then glucocorticoids convert proteins into glucose and increase blood flow. CRH stimulates the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary and ACTH prompts the adrenal gland to secrete the glucocorticoids.

If the stress continues, the locus coeruleus releases more NA and communicates with the amygdala, causing more CRH to be released, and a vicious circle begins (see Sapolsky, 2003). The behavioural response to administration of CRH is consistent with the brain's reaction to aversive stimuli, where CRH enhances conditioned emotional response (Cole and Koob, 1988) and decreases the amount of time spent in the centre of an open field – a sign of anxiety and stress (Britton et al., 1982). Blockade of CRH prevented stress in rats (Heinrichs et al., 1992).

The consequences of our bodies' physiological reactions to stressors can give rise to many health problems. If there is a long-term stress reaction, these responses are harmful. The area of health psychology has focused on stress and its effects on, for example, heart disease and immunology (see Chapter 35).

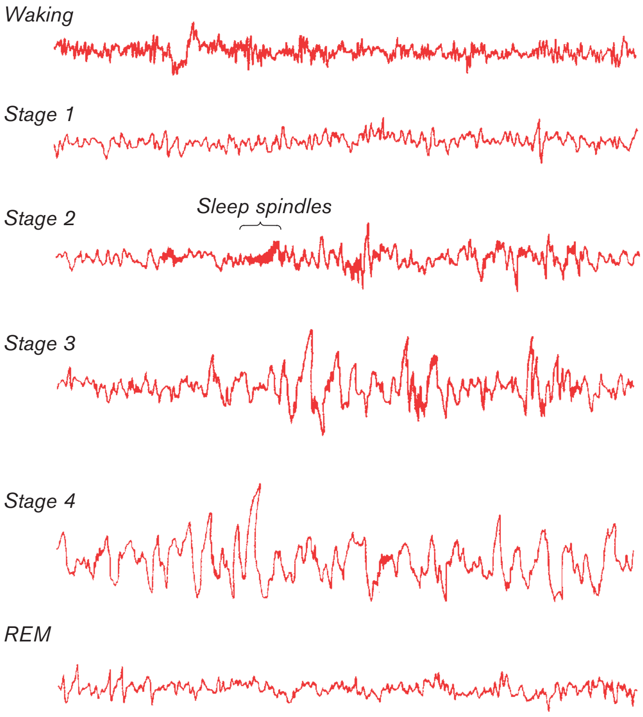


Figure 10.8 The EEG recording of the different stages of sleep
Source: adapted from Horne, 1988

Sleep

Many of us are preoccupied with our emotions during our waking moments and sometimes these emotions interfere with the respite of sleep. We spend a great deal of time asleep and sleep takes us into a different state of consciousness.

Stages of sleep

The brain's activity can be measured by placing electrodes on the scalp; this psychophysiological measure is called an electroencephalogram (EEG). Despite appearances to the contrary, the EEG reveals that the brain goes through a number of different stages of sleep.

The brainwaves present during the various stages of sleep can be seen in Figure 10.8. When we are awake there are two types of brain activity: alpha activity and beta activity (or waves). Alpha activity predominates during rest and inactivity, whereas beta activity is associated with being alert. The brain's activity changes through the four stages of sleep.

Stage 1 sleep is the initial entry into the sleep state and represents a transitional state. The EEG indicates that the brain activity has changed, producing a theta wave. After a short period the person enters Stage 2 sleep. The EEG recording during Stage 2 is irregular: there is theta activity, with a burst of activity called sleep spindles. Stage 3 sleep is characterised by delta waves and during Stage 3 sleep the number of spindles diminishes. The difference between Stage 3 and Stage 4 is not clear cut, but appears to be related to the number of delta waves. In Stage 3, there are fewer than 50% delta waves, whereas in Stage 4 there are more than 50%. These stages are called slow-wave sleep.

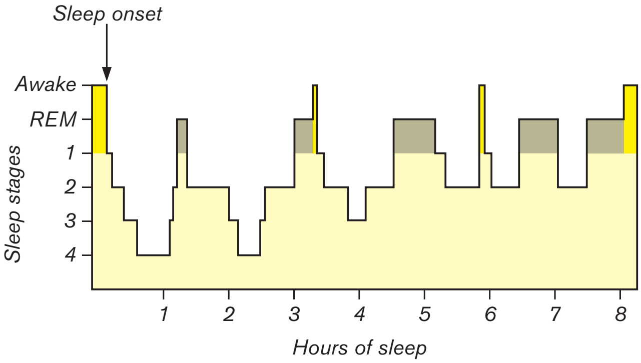


Figure 10.9 The pattern of REM activity over a night's sleep
Source: adapted from Kales and Kales, 1970

It takes about an hour to go through Stages 1 to 4 and these stages are referred to as non-rapid eye movement (non-REM) sleep. After about 45 minutes of Stage 4 sleep there is a change in the EEG recording. The brain activity is desynchronised, with some theta and beta activity. Electrodes attached to the muscles of the eye to detect movement (an electrooculogram (EOG)) indicate that the eyes are active. This is called REM sleep and during this sleep phase the rest of the body is paralysed.

During a night's sleep there is a cycle of non-REM and REM sleep. Each cycle lasts about 90 minutes, one-third of which may be REM sleep (see Figure 10.9).

Self-test: What are the stages of sleep?

Dreams

We are in a different state of consciousness when we are asleep, but we are not unconscious. The fact that we dream indicates that the brain is active during sleep and the visual cortex in particular is active during sleep (Madsen et al., 1991). This may account for REM sleep; indeed the brain activity during REM sleep is similar to that of a person scanning a visual scene (Miyauchi et al., 1990).

The function of dreams and REM sleep is still to be determined. However, many theories have been put forward to account for dreams. For example, Freud attempted to account for dreams as revelations from the unconscious and claimed that an interpretation of a dream such as posting a letter had a sexual content. Most postal workers may disagree with this, particularly early in the morning, but one has to remember that Freud also worked with cocaine!

Neural mechanisms of sleep

There are many changes in brain activity during sleep (see Maquet, 1999). Three neural systems are thought to produce sleep and these communicate with each other.

The forebrain

The forebrain can be isolated from the rest of the brain by surgery and is called the cerveau isole. The isolated forebrain can generate slow-wave sleep, while lesions of the basal forebrain prevent slow-wave sleep (Clemente and Sterman, 1963). Neurons during sleep became active, resulting in widespread inhibition of other brain regions (Gallopin et al., 2000).

Reticular formation

Stimulation of the reticular formation will wake a sleeping animal (Moruzzi and Magoun, 1949; see also Moruzzi and Magoun, 1995) and so the reticular formation appears to function as a wakeup call to the basal ganglia, thalamus and forebrain.

The pons

The pons is the focus of REM sleep and, if various cuts are made to transect the brain stem, the action of the pons's ability to trigger REM sleep can be seen. If the transection is below the pons, the brain shows alternation between slow-wave sleep and REM sleep. A particular waveform is indicative of REM sleep: PGO waves (pons, geniculate and occipital cortex) arise from the pons and go to the cortex. If the transection is made higher, leaving the pons in contact with the medulla and spinal cord, then the body shows REM sleep.

Neurotransmitters and sleep

Serotonin and noradrenaline have both been implicated in the control of sleep. Serotonin is found in the raphe nucleus of the reticular formation, where activation of the raphe nucleus produces arousal, and inhibition of 5-HT synthesis reduces it (Peck and Vanderwolf, 1991). Sleep is disrupted in rats with lesions of the raphe nucleus (Jouvet, 1999). When aroused the raphe nucleus is active, when in REM sleep it is silent (Trulson and Jacobs, 1979).

The noradrenergic neurones of the locus coeruleus show increased firing during waking hours and decreased firing during sleep (Aston-Jones and Bloom, 1981). Noradrenaline release is associated with the change from sleep to wakefulness (Mendelson, 2001).

Acetylcholine in the pons produces the activation of eye activity during REM sleep and PGO waves (Baghdoyan et al., 1984; Kodama and Honda, 1996).

The different actions of neurotransmitters promote either sleep or waking. The fact that neurotransmission is altered during sleeping and waking states permits the modification of sleep. However, drugs that are used to induce sleep act elsewhere.

Self-test: What are the neural mechanisms of sleep?

Sleeping pills

Drugs can be used to aid sleep; these are called hypnotics. Barbiturates were once used to induce sleep and they act at the GABA A receptor and influence such areas of the brain as the reticular formation. However, barbiturates are dangerous drugs with abuse liability. Another group of drugs, the benzodiazepines (such as diazepam (Valium)), are also effective hypnotics. The benzodiazepines act at a receptor complex on GABA neurons; they are anxiolytic and somewhat safer to use than barbiturates. However, benzodiazepines are also used to treat anxiety disorders and there is a high risk of dependence developing.

Why do we need to sleep?

This may seem like a simple question with a straightforward answer: because we are tired! However, although there are several theories about the function of sleep, a definitive answer is elusive.

An evolutionary account of sleep involves animals conserving energy and avoiding danger (Meddis, 1975). Perhaps this is why we sleep best at night. Our visual system is not tuned for night vision and therefore we are vulnerable during the hours of darkness. The opposite is the case for nocturnal animals that function best at night.

When we are awake, we are busy. This requires energy and there is wear and tear on the body, so sleep has been considered to be a period in which restoration of the body can take place (Moruzzi, 1972). After a difficult day, you may feel like you could sleep for a long period of time. However, a strenuous day does not lead to an increase in sleep. Sleep patterns can change over the lifespan. Why do babies sleep so much? Perhaps the answer lies in the fact that growth hormone is released when they are asleep.

Another view is that sleep is cognitively beneficial. Sleep aids the retention and consolidation of material learned during the day (Stickgold and Walker, 2005, 2007; Walker and Stickgold, 2006). REM sleep increases after learning and brain activity during REM sleep has been shown to be similar to that when performing a task (Maquet et al., 2000). However, other studies have failed to show a specific effect with REM sleep, but have concluded that the density of sleep spindles in Stage 2 sleep is correlated with recall performance on a learned task (Gais et al., 2002).

In order to understand the function(s) of sleep others have argued that this can only be achieved in an evolutionary context (Kavanau, 2004). From such a perspective, Kavanau has argued that sleep is required because of the development of complex vision. Essentially the dual processes of the brain compete when awake, and sleep allows one of those processes (vision) to have little impact on other neural activities, e.g. memory consolidation (Kavanau, 2005).

Self-test: What is sleep for?

Sleep disorders

Disorders of sleep – whether it is too much or too little – can have a profound effect on behaviour. Simply not getting enough sleep can produce a number of problems (see Activity box 10.2).

Insomnia

Insomnia is difficulty in falling asleep or staying asleep. However, there are large individual differences in the amount of sleep a person needs. Margaret Thatcher, for example, reputedly needed very little sleep when she was prime minister. Thus insomnia is relative to an individual's needs. Some people may seek a medical solution to insomnia (see later). However, this can have rebound effects when drug treatment is discontinued.

Narcolepsy

People who cannot resist falling asleep at inappropriate times during the day have a condition called narcolepsy. However, if you were to fall asleep during a tedious lecture, this would be quite normal and not a symptom of narcolepsy!

There are specific symptoms of narcolepsy: cataplexy, sleep paralysis and hypnogogic hallucinations. Cataplexy happens when the person is awake and during cataplexy there is a complete paralysis of the body – the person simply can't move. One view of cataplexy is that the muscle paralysis in REM sleep occurs out of context. Sleep paralysis is similar to cataplexy, but happens either just before or just after sleep. Hypnogogic hallucinations are dreamlike states that happen prior to falling asleep, but while still awake. They occur during sleep paralysis and are not that form of daydreaming you may also experience during a tedious lecture.

Narcolepsy is primarily a genetic disorder (Lin et al., 1999) and the gene that is dysfunctional in narcolepsy codes for the peptide orexin (Kilduff and Peyron, 2000). Orexin has been shown to be reduced in people with narcolepsy (Peyron et al., 2000) and general sleepiness (Martinez-Rodriguez et al., 2003).

A number of pharmacological treatments are available for narcolepsy, but none of these drugs directly influences orexin levels. They are stimulants that act on dopaminergic, serotonergic and noradrenergic systems (e.g. methylphenidate aka Ritalin).

ACTIVITY BOX 10.2

What are the effects of sleep deprivation?

If you have very young children or very noisy neighbours you will be familiar with the effects of sleep deprivation.

Using your previous experience think about how sleep can affect your behaviour.

Now that you are studying psychology, when and why might you consider a good night's sleep essential?

Many students prior to an examination have difficulty sleeping or engage in last-minute revision. We have already seen how important the frontal lobes are in answering exam questions. Experimental studies have shown the consequences of sleep deprivation to the frontal lobes (see Jones and Harrison, 2001, for a review).

Sleep deprivation has been shown to impair working memory (Smith et al., 2002), creative thinking and attention (Wimmer et al., 1992).

The importance of a good night's sleep for children was highlighted by Randazzo et al. (1998). In this study children aged between 10 and 14 had their sleep restricted. These children performed poorly on complex cognitive tasks, whereas simpler tasks remained the same as for non-sleep-deprived children. So when your parents said you needed a good night's sleep on school days they were right!

Sleep deprivation

Sleep deprivation can have serious consequences. For example, sleep-deprived rats have reduced immunity, which can be fatal (Everson, 1993); this supports a restorative theory of sleep. In extreme cases, most humans with fatal familial insomnia die within 2 years of the insomnia starting (Manetto et al., 1992).

Obviously, death is a dramatic consequence of sleep deprivation, but there are more subtle effects of a lack of sleep (see Applications box 10.1).

Self-test: Describe insomnia and narcolepsy.

APPLICATIONS BOX 10.1

Doctors work long hours with little sleep: reason enough to activate our amygdala

Performance on many tasks can be impaired by sleep deprivation. There are a number of occupations in which sleep deprivation can have dramatic effects. A lack of sleep on the part of the driver whose car derailed a train in Selby, Yorkshire in 2001 was cited as an influence in the accident. Experimental evidence also suggests that partial sleep deprivation can alter driving (De Valck et al., 2003).

The recent wars in Afghanistan and Iraq have required military personnel to be without sleep during stressful situations, and this could have a dramatic effect on combat performance. Indeed, marksmanship has been shown to deteriorate in elite soldiers after nearly 73 hours of partial sleep deprivation (Tharion et al., 2003), as did cognitive performance (Lieberman et al., 2002).

The one profession we hear the most about in relation to sleep deprivation is medicine. Hospital doctors have to work long hours with very little sleep. This is said to affect their judgement, which is sometimes critical to the wellbeing of their patients (see Buysse et al., 2003). For example, a doctor needs to be attentive in giving the correct dose of a drug to a patient, or vigilant in the diagnosis of symptoms.

Recent research looking at sleep deprivation and fatigue in surgeons indicated an increase in errors when they were sleep-deprived (Eastridge et al., 2003).

It would be reasonable to assume that when confronted with a tired doctor our amygdala should be active, and fear expressed!

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the role of the amygdala and the hippocampus in fear.
2. Describe the stress response.
3. Explain why we need sleep.
4. Describe the stages of sleep.

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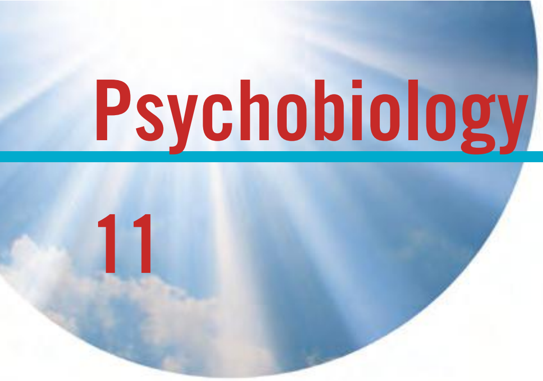


11

Perceptual systems and motor control

Route map

In this chapter, you will be introduced to the mechanics of the sensory systems, such as the eye, the ear and the nose. The route a perceptual signal takes once it has been detected by the senses is further described, with all culminating in the cortex. In the second part of the chapter, we will look at motor control and response output.

Introduction

We receive large amounts of information about our environment via our senses and this information is converted into neural impulses that are sent to the brain via afferent neurons. Incoming information from all the senses is integrated in the brain. We are not simply passive recipients of sensory input; we respond to incoming information. For example, we orient to a loud noise (see Chapter 8). Some of the responses are automatic, while some require consideration and selection.

The sensory modalities (see later) are the channels that receive information, but then it is the brain that interprets the signals. It is the brain that perceives and it is the brain that sees, hears, tastes, smells and feels pleasure and pain.

Sensory modalities

As mentioned earlier, the sensory modalities are those that receive information and send signals about the environment to the brain.

Vision

More emphasis is given to visual perception than any other sensory modality. The eye and the brains interpretation of signals from the eye have been studied extensively and this chapter will look at the mechanics of the visual system.

The retina

The eye is made up of a number of structures (see Figure 11.1). Light enters the eye and lands on the retina. Thus an image of the environment is projected directly on to the retina. The retina is part of the CNS and comprises several cellular layers that communicate with each other using neurotransmitters. Most importantly, the retina contains cells receptive to light (photoreceptors). There are two types of photoreceptor, which have an uneven distribution over the retina: rods and cones.

Self-test: Describe the eye.

Rods are very sensitive but do not provide high acuity (fine detail) or colour. They are found in greater numbers on the edges of the retina. Cones, by way of contrast, provide high acuity and respond to colour. There is a high

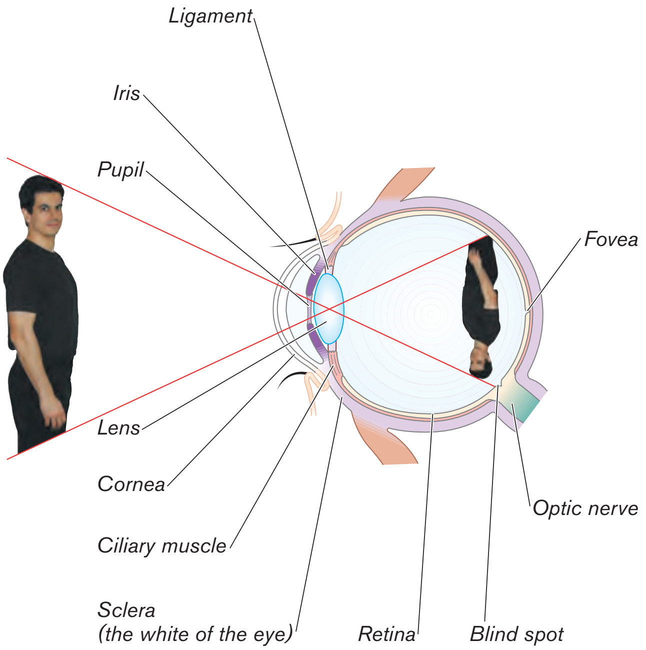


Figure 11.1 The eye

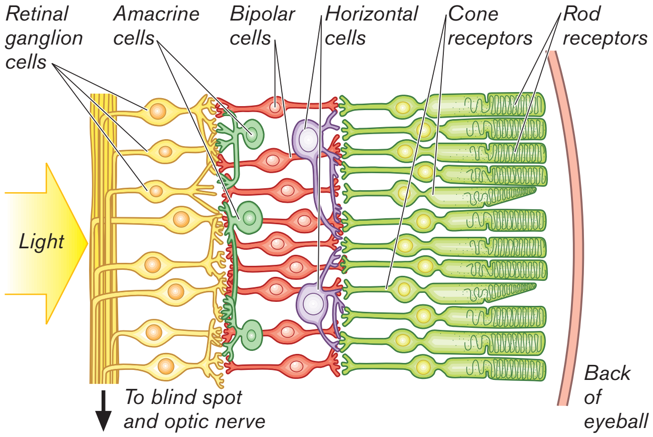


Figure 11.2 The retina
Source: adapted from Pinel (2003)

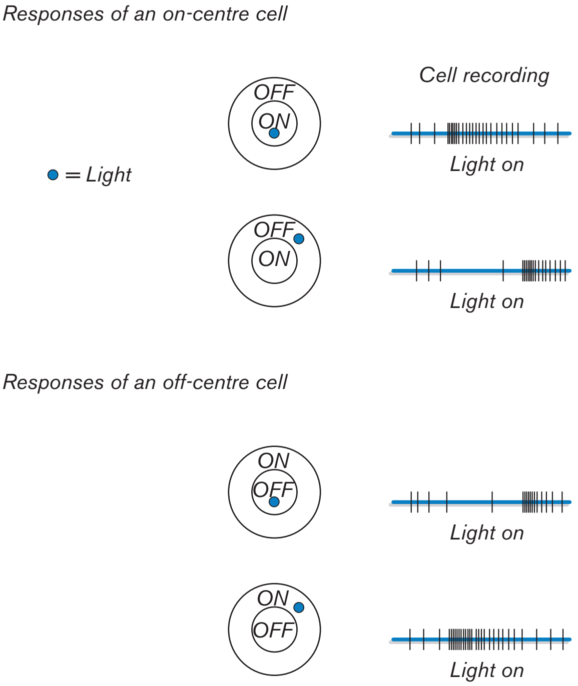


Figure 11.3 Receptive fields can be divided into areas that are 'on' or 'off'; the cell fires more when light is projected onto the on-area

density of cones in a central area of the retina called the *fovea*.

Photoreceptors are connected to interneurons and ganglion cells that form the optic nerve (see Figure 11.2). After looking at Figure 11.2 you will probably conclude that the retinal cells appear to be inside out. You are right; this is an artefact of embryological development and the retina is equipped to deal with it. The point at which information funnels out of the retina on its way to the brain (via the optic nerve) is called the blind spot (see Activity box 11.1).

Self-test: What is the composition of the retina?

When light falls on the rods and cones, they convert the image into a neural impulse. The rods and cones contain visual pigments that are photosensitive and there are different visual pigments that are made from opsins and retinal (Wald, 1964). Rhodopsin, usually referred to as the chemical for rods, is now also used to refer to the visual pigments for cones.

In the dark, rods are relatively depolarised – about -35 mV (see Bowmaker, 2002). This is achieved because rhodopsin is not activated. Rhodopsin is G-protein linked. A second messenger (cyclic GMP) keeps Na^+ channels open and Na^+ can flow into the rod. To counteract this, K^+ flows out. The rod in the dark state releases glutamate. However, light produces a reaction with rhodopsin – it disrupts the second messenger and Na^+ is no longer permitted to enter the cell. The rod then becomes hyperpolarised and glutamate release stops. In continuous light the rod will recalibrate itself to the ambient light (see Bowmaker, 2002).

The released glutamate from the photoreceptors differentially reacts with the next cellular layer, the bipolar cells. These cells are divided into two receptive fields: off-centre cells and on-centre cells. The cells of the visual system have receptive fields that are sensitive to light (see Figure 11.3). When light is shone in the on-area, the cell fires. If a light is shone in the off-area, it does not fire. Other cells have off-centres and on-surrounds.

The effect of having two receptive fields is that the cell responds best when there is contrast. If both receptive fields of the cell have light on them the cell does not fire – one field cancels out the other. The consequence of having receptive fields is illustrated in Activity box 11.2.

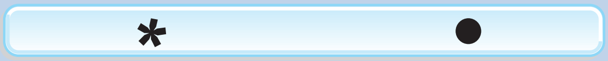
When the light is off, glutamate is released, which depolarises off-centre bipolar cells. Conversely, in on-centre bipolar cells, the reduction of glutamate in response to the light on photoreceptors results in a depolarisation. Thus

ACTIVITY BOX 11.1

The blind spot

The point at which the retinal cells exit the eye is called the optic disk. This produces an area where images cannot be seen.

Close your left eye. Focus on the * below. Maintain your focus and move the book backwards and forwards. There is a point at which the black circle is not visible. Congratulations! You have found your blind spot.



glutamate can influence cells in two different ways, depending on the type of receptive field it has.

When activated, bipolar cells release glutamate, which stimulates the retinal ganglion cells. Again, there are two types of ganglion cell: on-centre and off-centre (Kuffler, 1953). The retinal ganglion cells respond to incoming information and relay the coded messages about light and dark to the brain. The retinal ganglion cells form the optic nerve.

Self-test: What is a receptive field?

Convergence

Cones feed into the bipolar cells with a degree of low convergence; that is, each cone speaks to a small number of bipolar cells (both on- and off-centre bipolar cells; see Figure 11.4). The different response to incoming information from cones is determined by glutamate receptors. On-centres have metabotropic receptors; off-centres have ionotropic receptors. A decrease in glutamate at the metabotropic receptor produces a depolarisation and at the ionotropic receptor, a hyperpolarisation.

Rods, in contrast, have high convergence. Large numbers of rods synapse on to a single bipolar cell (see Figure 11.4). This makes the system very sensitive, but it has low acuity (i.e. it detects changes in light relatively easily but is not very good at transmitting fine detail in the visual field).

Lateral inhibition

While it is clear that visual information is transmitted from the eye to the brain, there is also communication between the cells of the retina (horizontal communication). Look at Figure 11.2 again and you will see a set of cells that communicate across the retinal cells: the amacrine cells and horizontal cells. Horizontal cells synapse with the photoreceptors and provide feedback that is in opposition to the photoreceptor. If a rod stimulates a horizontal cell, it sends a message back saying ‘stop it’. Note that horizontal cells synapse with more than one photoreceptor, and horizontal cells are involved in a process called lateral inhibition.

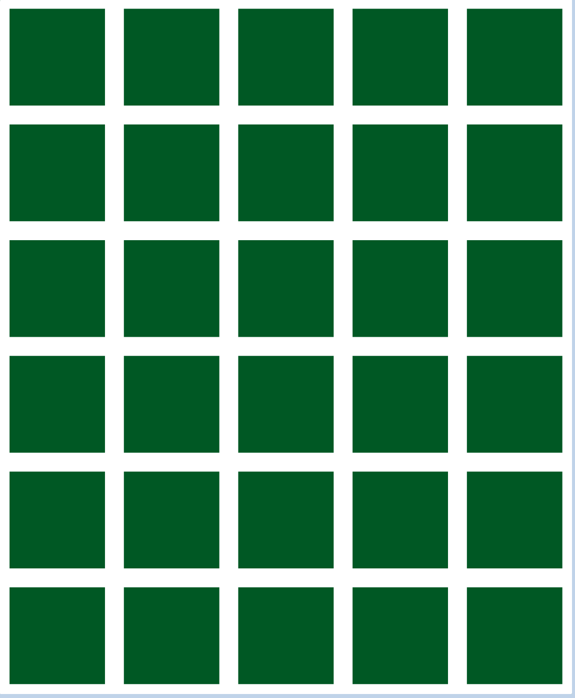
Studies on the horseshoe crab have cast light on the mechanisms of lateral inhibition (Hartline et al., 1956). Lateral inhibition is when one neuron inhibits its neighbouring neurons. Light activates a photoreceptor and glutamate release stops. The horizontal cell sends inhibitory

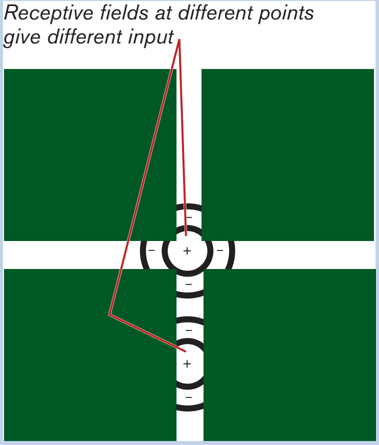
ACTIVITY BOX 11.2

Receptive fields

Look at the grid below. You may have to adjust the distance from your eyes to get the full impact. What can you see? Hopefully at the junction of each white line you can see white. However, around the junction you are focusing on there are grey dots. Try to focus on a grey dot, though. You can’t!

The reason for this effect is due to receptive fields. At the junction there are four inhibitory inputs compared to one excitatory input. Along the white line there are only two inhibitory inputs compared to one excitatory input. The firing of the cell will be influenced by the ratio of input across the receptive field. The information coded by the cell is then passed on to the next set of neurons in the visual pathway.




Receptive fields at different points give different input
+
−
+
−

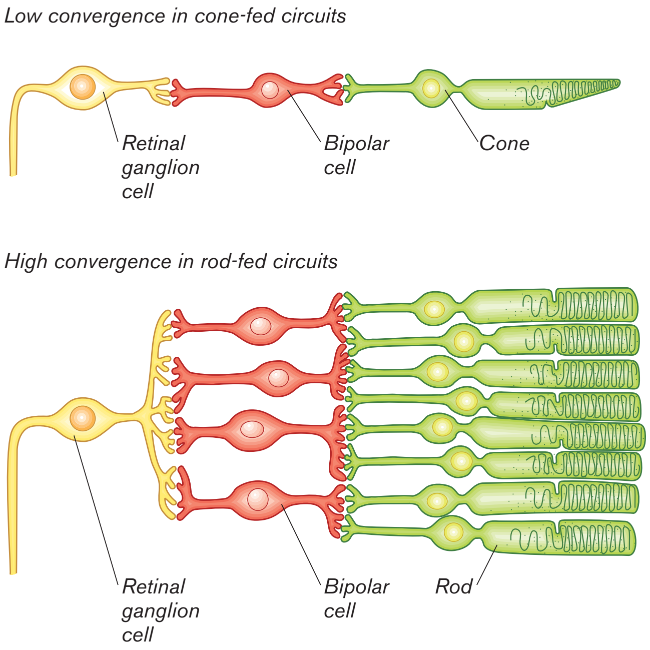


Figure 11.4 Rods and cones differ in their degree of convergence onto bipolar cells; many rods feed into one retinal ganglion cell (high convergence), whereas cones have low convergence with fewer cones feeding into the retinal ganglion cell
Source: adapted from Pinel (2003)

messages (using GABA) to all the photoreceptors it is connected to.

Look at Activity box 11.3 to see the effects of lateral inhibition. The effect is achieved because the edges of the different contrasting bands are being differentially inhibited (see Figure 11.5). The receptor at the edge of the more intense light fires more than the other receptors receiving the same light input. On the darker side, the receptor at the edge fires less compared to the others in the middle of the band. The middle receptors fire at the same rate because they receive the same amount of stimulation and the same amount of inhibition from the horizontal cell. The receptors at the edge of the light receive the same amount of light input, but receive different levels of inhibition. The bright receptor inhibits the darker receptor. Meanwhile the darker receptor has less inhibitory power on the adjacent bright-sided receptor.

The amacrine cells, which communicate with the bipolar and retinal ganglion cells, achieve a similar process. Depending on the type of incoming information from the bipolar cells, the amacrine cells can inhibit retinal-ganglion cells.

Self-test: Describe lateral inhibition.

The optic nerve

The optic nerve is the collated axons of the retinal ganglion cells. Because we have two eyes, we have two optic nerves. Two eyes mean we have slightly different images of the same stimuli; this is called binocular vision. Look at an object and close one eye. Close the other eye and open the first eye. You will see that the image of the object is slightly different and it appears to move. The information that is transmitted to the brain is sorted according to the visual field.

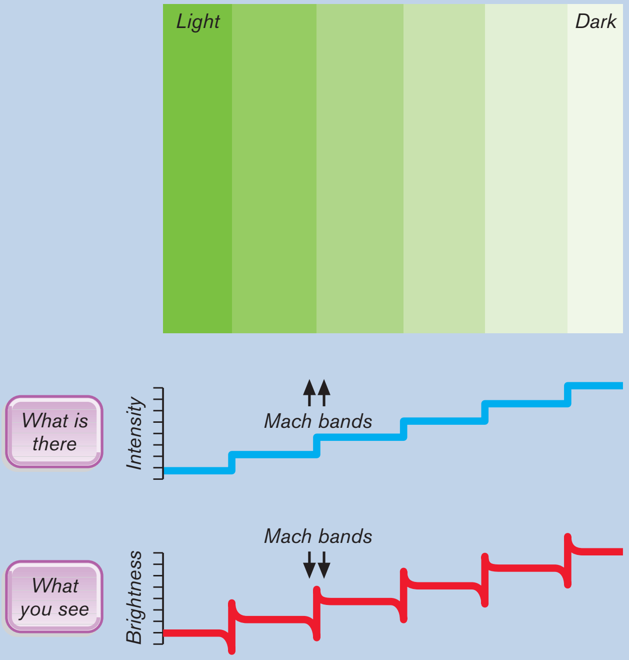
ACTIVITY BOX 11.3

Lateral inhibition

Look at the Mach bands below. What do you see? Within each band there appears to be a gradient of tone. Now take two pieces of paper and cover all but one of the Mach bands. Now what do you see?

Hopefully you can see that there is no tonal gradient within a band. What is there and what you see are two different things. How can we account for this effect?

The answer lies in lateral inhibition and what is happening at the edge of each band.



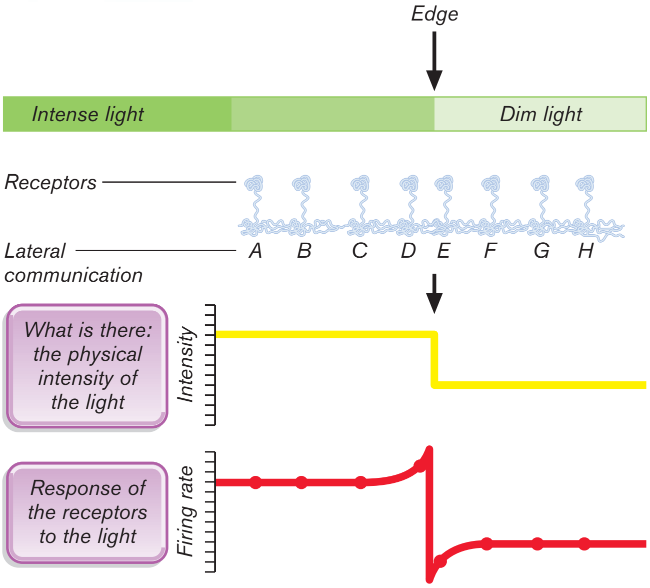

Edge
Intense light
Dim light
Receptors
Lateral communication
A
B
C
D
E
F
G
H
What is there: the physical intensity of the light
Intensity
Response of the receptors to the light
Firing rate

Figure 11.5 The cells of the retina communicate with each other in a process called lateral inhibition, which is responsible for the contrast enhancement seen in Activity Box 11.2

In Figure 11.6, you can see that the nasal hemiretina projects to the opposite side of the brain (contralateral) and the temporal hemiretina projects to the same side of the brain (ipsilateral). Information from both eyes is integrated.

The point at which the visual fields cross is called the optic chiasm. There are no connections in the optic chiasm; the axons of the optic nerve synapse at the lateral geniculate nucleus (LGN) of the thalamus.

Self-test: What are the hemiretinas?

The LGN

The LGN is a multilayered structure. Each layer contains a map of the visual field. There are six layers that can be differentiated into two types, depending on the size of the cell: the magnocellular layer and the parvocellular layer (see Figure 11.7). Signals from cones tend to innervate the parvocellular layer and signals from the rods innervate the magnocellular layer.

The information from the retina does not appear to be reorganised by the LGN (Derrington, 2002). The information at this point may be integrated with other signals before they are passed to the cortex. The magnocellular and parvocellular layers project to the occipital cortex (visual cortex).

Self-test: Describe the pathway mediating visual information.

The visual cortex

The visual cortex interprets the signals that are received from the retina via the LGN. Within the visual cortex, there are two types of cell that respond to visual input: simple cells and complex cells. Our understanding of these comes mainly from the early experiments of Hubel and Wiesel. Their experiments used animals that had electrodes placed in regions of the visual cortex to record activity. Light was shone on the retina and changes in the firing rate of the cells could be measured.

Hubel and Wiesel (1959, 1962, 1968) discovered that receptive fields were round. They also comprised two receptive fields. This was the case for all the cells in the visual pathway.

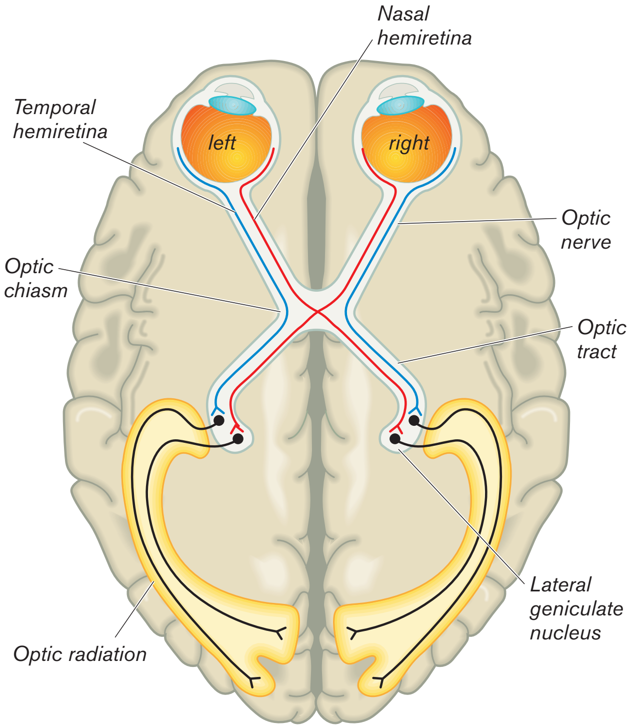

Nasal hemiretina
Temporal hemiretina
left
right
Optic nerve
Optic chiasm
Optic tract
Lateral geniculate nucleus
Optic radiation

Figure 11.6 The passage of information from the visual fields of the retina to the LGN and cortex

Simple cells

The simple cells of the visual cortex differ from the cells of the rest of the visual pathway inasmuch as they have visual fields that are divided by straight lines (see Figure 11.8). They respond best when the light falls in a particular orientation. The hypothesised manner by which the LGN projects this information to the simple cells is depicted in Figure 11.8.

Complex cells

Complex cells are more numerous than simple cells and respond to straight lines of a particular orientation. Complex cells differ from simple cells in three ways:

1 They are large.

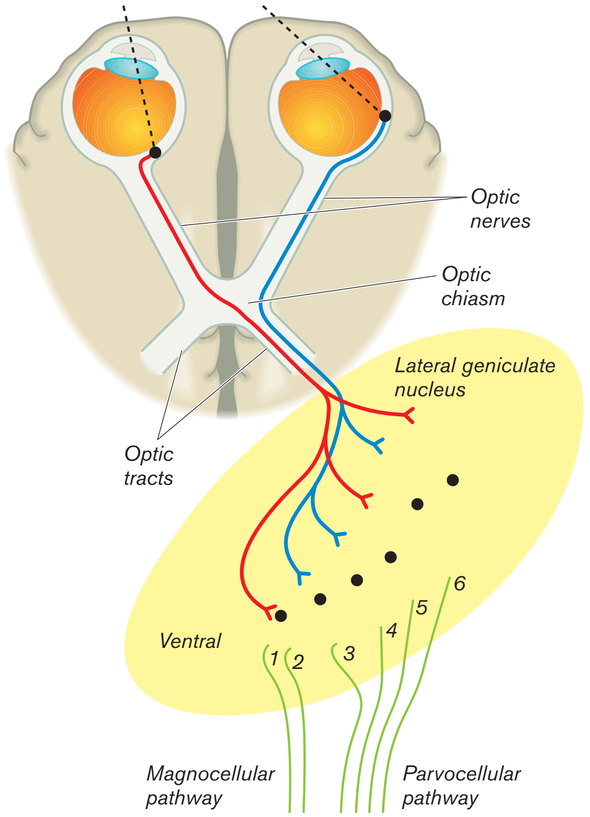


Figure 11.7 The parvocellular and magnocellular layers of the LGN

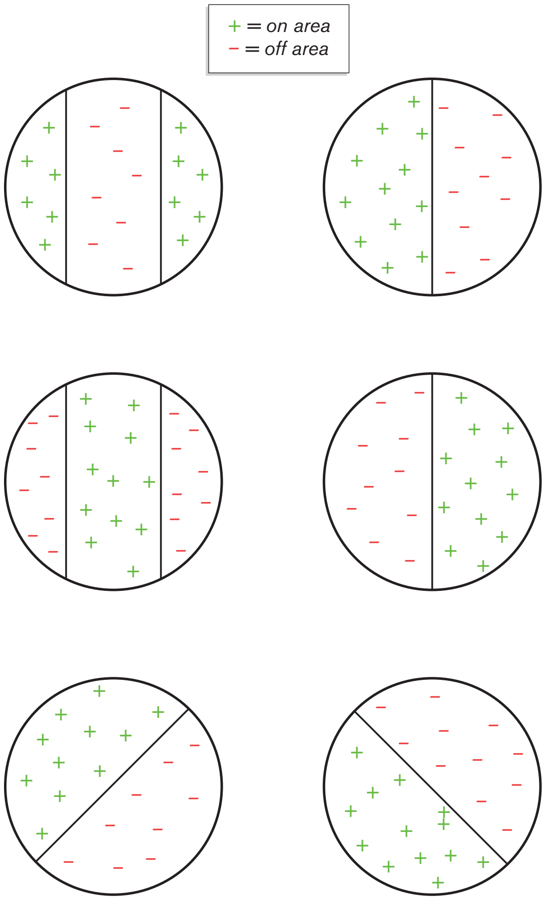


Figure 11.8 Simple cells have zones that can be mapped into on- or off-areas

2 The receptive field cannot divide into on- and off-areas.
3 They are binocular, whereas simple cells are monocular (one eye).

Complex cells respond to stimuli in their entire receptive field (see Figure 11.9). The incoming information from simple cells to complex cells is depicted in Figure 11.9.

Self-test: What is the difference between simple cells and complex cells?

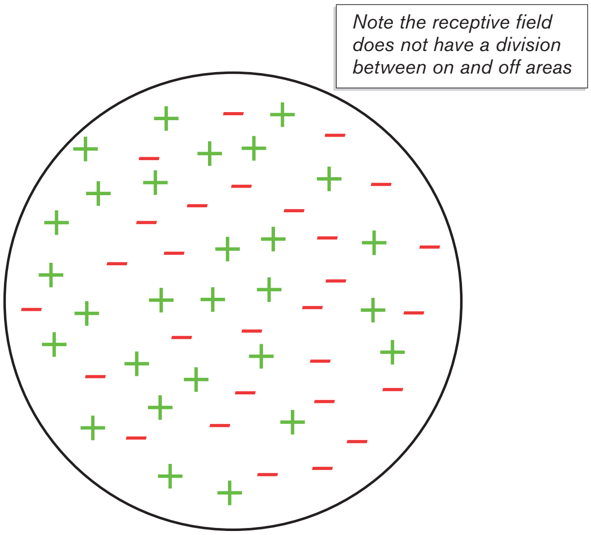
Spatial frequency

The receptive fields of simple and complex cells led to the notion of edge and bar detectors. This somewhat oversimplified account gave way to the spatial frequency theory, which states that cells work on the number of light/dark cycles in a receptive field. If you look at the grids in Figure 11.10 you can see high- and low-frequency grids and how retinal ganglion cells can interpret them. These grids can be described by a sine wave. These sine waves can differ from each other in frequency (width of light/dark cycles), amplitude (the difference between the light and dark parts of the grid) and angle. The complexity of a visual stimulus can be broken down into constituent sine waves by a mathematical process called Fourier analysis.

Presentation of sine-wave grids, in the same way that Hubel and Wiesel presented light, demonstrates that cortical cells are more responsive to this type of stimulus (De Valois et al., 1979). The cells of the visual cortex are thought to perform a biological version of Fourier analysis on the incoming information. This analysis turns the complex spatial information into its component sine waves. Cortical cells are individually tuned for a particular orientation and frequency. Therefore different groups of cells will be active depending on the spatial frequency of the visual stimuli. The initial work by Hubel and Wiesel can be accounted for in these terms, as they presented stimuli that could be described by spatial-frequency analysis.

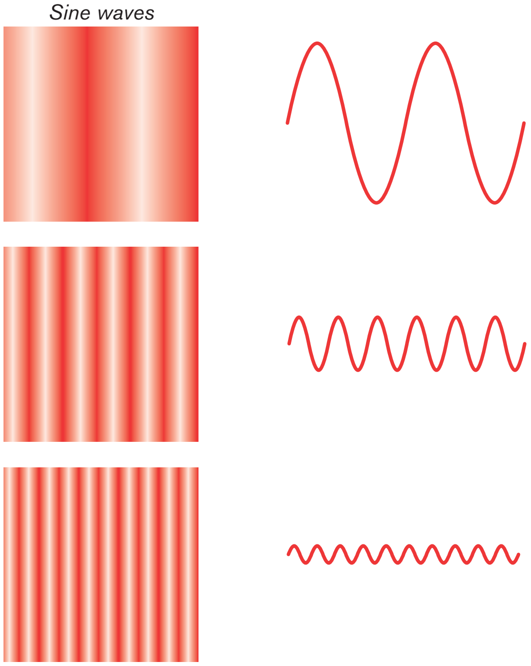
Hypercolumns

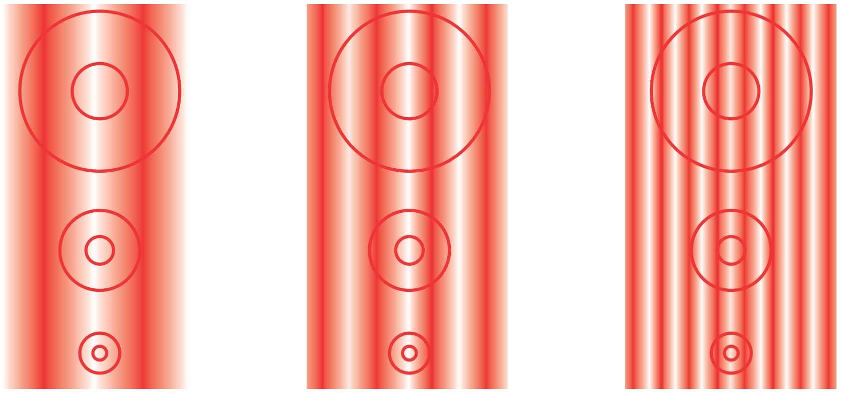
Cortical cells are organised in columns. Proceeding down a column, all the cells have receptive fields in the same visual field. They also respond to stimuli of the same orientation (Hubel et al., 1978). Cutting across the columns, the next in line has a slightly different input from a different location of the visual field, and responds to stimuli of a slightly different orientation. Each column has a dominant input from either the left or right eye.



Note the receptive field does not have a division between on and off areas

Figure 11.9 Complex cells do not have distinct zones that are either on or off





Three vertical sine-wave gratings whose spatial frequency increases from left to right. Superimposed on each are the receptive fields of three ON-centre retinal ganglion cells.

Figure 11.10 Spatial frequency: (a) the sine-wave grids can be described in terms of their spatial frequency; (b) retinal ganglion cells respond to these grids depending on the amount of light falling in an on- or off-area

Summary of visual perception

The eye receives the complexities of our visual world and converts the information into neural messages for the brain to interpret. The cells of the brain work on the visual input to allow the person to have some understanding of the visual world. However, the brain does not automatically interpret the signals from the eyes. The brain has to learn to see and without experience has difficulty interpreting the visual world (see Focus point 11.1).

Audition

We hear many sounds that influence our behaviour and colour our emotions – for example, ‘dinner music’ can increase food intake in patients with dementia (Ragneskog et al., 1996). As with visual perception, auditory stimuli are converted into signals that are sent to the brain.

The ear

We also have two ears and having two ears helps us to locate sounds in space. Just as our different eyes have slightly different images, so our ears receive sounds milliseconds apart and this difference provides information about the location of the sound.

The part of the ear we can see is only the tip of the iceberg. The ear comprises the outer ear, the middle ear and the inner ear (see Figure 11.11). The outer ear is a funnel that collects sound waves and sends them to the middle ear. It consists of the pinna and the auditory canal.

FOCUS POINT 11.1

The brain requires experience to see

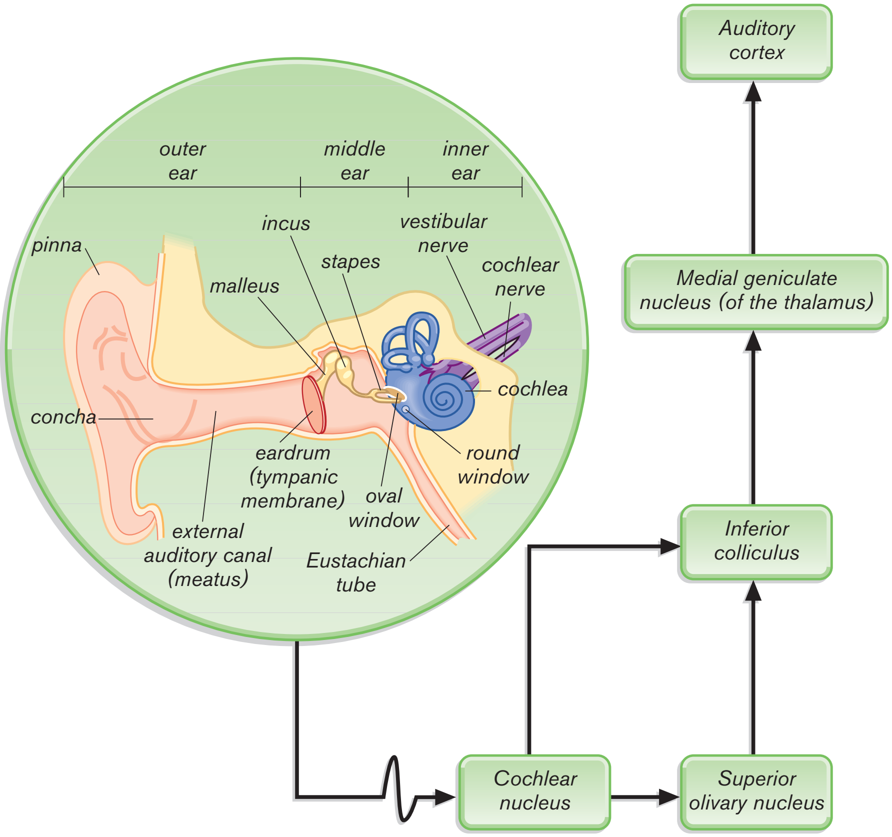
A recent report (Fine et al., 2003) indicated how the brain requires experience to make sense of the world. At the age of three MM lost his sight; 40 years later he received a corneal and stem-cell transplant to the right eye.

After the surgery, MM was tested to see what the impact of the surgery was. He experienced difficulty in interpreting three-dimensional images, and with object and face recognition. With regard to facial recognition, he had difficulty in determining gender and facial expression, and often resorted to individual features like hair length. Functional MRI scans indicated that during such recognition tasks his lingual and fusiform gyri – areas of object and face recognition – were not as active as those of control participants. His occipital lobe (visual cortex) was activated, thus he could see but he could not interpret the image.

His motion perception was good. When he was blind he was an accomplished skier. After surgery he would close his eye because he was frightened of a collision. Two years after surgery he was able to ski with sight, but he had to use the shading patterns of the snow to determine the slope. On difficult ski runs, however, he still chose to 'go blind'.

Sound waves vibrate the structures of the middle ear. The first structure to vibrate is the eardrum (tympanic membrane). The vibrations affect a set of three bones behind the eardrum called ossicles. These ossicles are called the hammer (malleus), anvil (incus) and stirrup (stapes), and vibration affects each one in turn.

The stirrup communicates with the inner ear by vibrating the oval window; the oval window is a thin membrane that covers the inner ear. The vibrations are conducted to the cochlea, a fluid-filled tube with a membrane that is receptive to auditory information. This membrane is called the *organ of corti* and is made up of three subcomponents: hair cells and the tectoral and basilar membranes.



outer ear
middle ear
inner ear
pinna
incus
vestibular nerve
stapes
cochlear nerve
malleus
cochlea
concha
eardrum (tympanic membrane)
round window
oval window
external auditory canal (meatus)
Eustachian tube
Auditory cortex
Medial geniculate nucleus (of the thalamus)
Inferior colliculus
Cochlear nucleus
Superior olivary nucleus

Figure 11.11 The components of the ear and the route to the auditory cortex

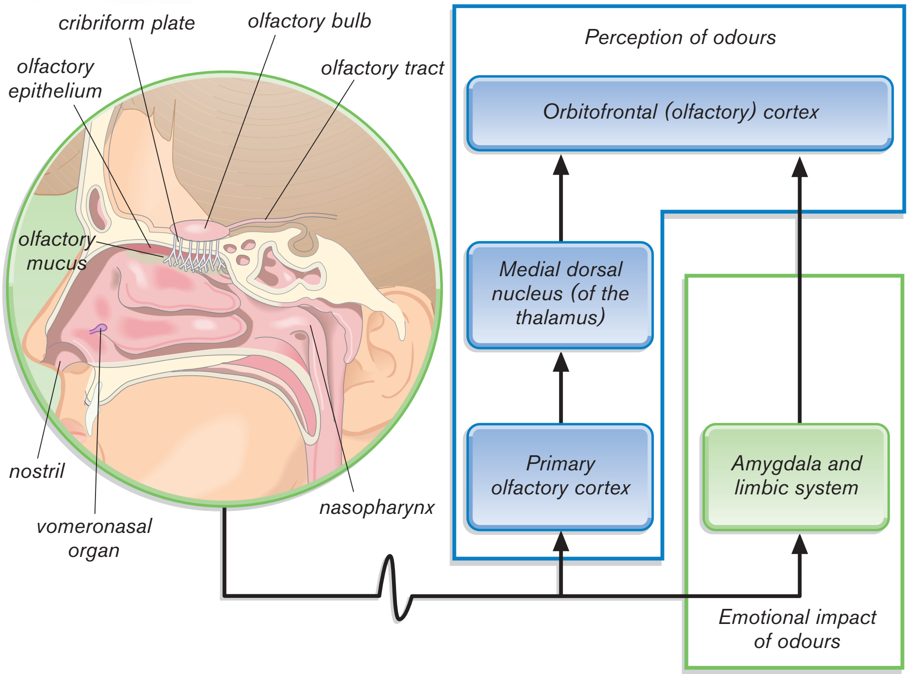


Figure 11.12 The components of the nose and the route to the olfactory cortex

Movement of the fluid in the cochlea is transmitted to movement of the basilar membrane and the hair cells that are attached to it. The hair cells are mechanoreceptors and they turn movement into action potential.

Self-test: Describe the ear.

The auditory nerve and cortex

The auditory nerve synapses with the hair cells and relays auditory signals to the brain, then enters the brain stem and divides in two. The split input projects to dorsal and lateral cochlear nuclei. The projections of the cochlear nuclei go to the superior olivary nuclei. This area receives and integrates signals from both ears and is used in auditory location. Other projections from the cochlear nuclei go to the inferior colliculus (see Figure 11.12). The superior olivary nuclei also send messages about location to the inferior colliculus.

The inferior colliculus connects to the medial geniculate nucleus (MGN) of the thalamus and the MGN then projects to the auditory cortex. The cells of the auditory cortex are in columns that respond to similar frequencies.

Self-test: How do we hear?

Olfaction

The perfume and deodorant industries are highly profitable. The increase in sales of aromatherapy products as an alternative medicine highlights the potential of olfactory mechanisms. However, scientific evidence for the effectiveness of aromatherapy is speculative (Martin, 1996). Smells are some of our most emotive stimuli and, as many of you will know, can retrieve vivid memories (LeDoux, 1998). The smell of a hospital is often a potent cue to aid memory of previous visits. Odours can also affect cognitive processing, for example bergamot reduces visual vigilance (Gould and Martin, 2001). The sense of smell is called *olfaction*.

The nasal membrane

The nose has receptors in the olfactory epithelium, which is located at the top of the nasal passage. An odour molecule interacts with the olfactory receptor and produces a depolarisation of the cell membrane. There are numerous receptors for different types of odour. (On a hot tube train at rush hour, evolution may appear to have done us no favours!) The action potential from the depolarisation is carried along the olfactory nerve, which then connects to the olfactory bulb, which in turn transmits impulses to the primary olfactory cortex (see Figure 11.12).

Olfaction does not have to pass via the thalamus on its way to the cortex. After leaving the primary olfactory cortex there are two branches the signals can take. The first is via the amygdala, which may give rise to the emotional response to odours. The second branch is to the medial dorsal nuclei of the thalamus and the signals from the amygdala and thalamus converge on the olfactory (orbitofrontal) cortex.

Somatosensation

Somatosensation is the process of communicating

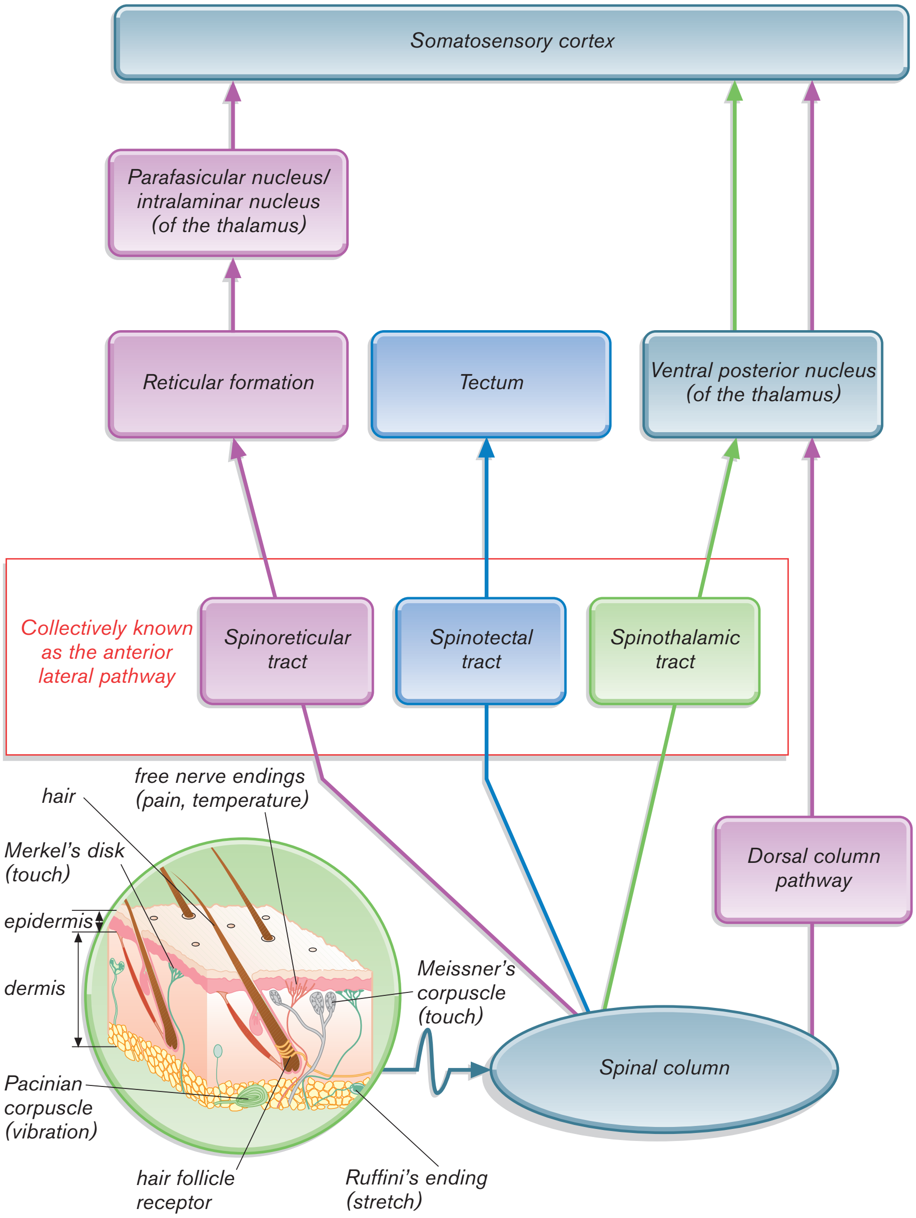

Somatosensory cortex
Parafasicular nucleus/ intralaminar nucleus (of the thalamus)
Reticular formation
Tectum
Ventral posterior nucleus (of the thalamus)
Collectively known as the anterior lateral pathway
Spinoreticular tract
Spinotectal tract
Spinothalamic tract
Dorsal column pathway
Spinal column
hair
free nerve endings (pain, temperature)
Merkel's disk (touch)
epidermis
dermis
Meissner's corpuscle (touch)
Pacinian corpuscle (vibration)
hair follicle receptor
Ruffini's ending (stretch)

Figure 11.13 The components of the skin and the route to the somatosensory cortex

information from regions of the body and messages are sent from the skin, muscles and joints etc. to areas of the brain.

The somatosensory system can be divided to account for external stimuli, internal influences (interoception) and where the body is positioned (proprioception).

Clearly, the somatosensory system has to integrate a great deal of information and the remainder of this section will focus solely on the sensation of touch. Touch is a useful mechanism to look at because of its involvement in pain (see also Chapter 35).

The skin

Touch is mediated through mechanoreceptors responsive to physical changes in the skin. Activation of these mechanoreceptors produces a depolarisation and thus an action potential is transmitted.

Transmission of tactile stimuli to the brain

The action potentials initiated by the mechanoreceptors are sent along the axons of afferent nerves and enter the dorsal column of the spinal cord. The part of the skin that projects to the dorsal column is segregated and called a dermatome. There are two pathways that carry different information to the brain: the anterior lateral system and the dorsal column system. The anterior lateral system carries thermal and nociceptive (pain) messages; the dorsal column system sends touch information.

The dorsal column passes to the dorsal column nuclei where the axons cross over to project to the other side of the brain. The neurons pass through the medial lemniscus where they synapse at the ventral posterior nucleus of the thalamus. From the thalamus, electrical signals are projected to the somatosensory cortex (see Figure 11.13).

Nociception: perception of pain

The anterior lateral system is divided into three pathways: the spinothalamic pathway, the spinoreticular pathway and the spinotectal pathway. All these pathways begin at the spine and end up at different locations: the thalamus, the reticular system and the tectum respectively. The spinothalamic pathway and the spinoreticular pathway both project to the thalamus and then to the cortex.

This system sends pain information via two afferent nerves: C-fibres and Aδ-fibres. Aδ-fibres send fast pain messages, whereas C-fibres send slow pain messages (‘ouch!’ and ‘ache’ respectively).

The pain fibres have a diffuse set of projections that can account for perception and reflex actions and response to pain is mediated via efferent neurons that produce a motor response.

Pain control

Nobody likes pain (except perhaps for masochists), so why should we have to experience it? Clearly, an evolutionary explanation can account for its necessity. Think of what would happen to you if you could not experience pain – it could seriously compromise your chance of survival.

Melzack and Wall (1965) proposed the influential gate control theory of pain. They claimed that cognitive and emotional factors could, via descending brain circuits, mediate the blockade of incoming pain signals (see Chapter 35 for a more detailed account). Such descending circuits have been identified, most notably including the periaqueductal gray (PAG) where stimulation is analgesic. The PAG also contains receptors that modulate pain, called endorphin receptors, and that respond to endorphins: our natural painkillers. It is within this system that opiate analgesics are effective. The PAG projects to the raphe nuclei, which then project down the spinal column where the pain signal is blocked (Basbaum and Fields, 1978).

The neural circuitry of pain is complex and challenging to the neuroscientist. There are many features of pain that still require understanding.

Self-test: What is nociception?

Gustatory system

One only has to watch one of the plethora of celebrity cookery programmes on TV to hear about something ‘tickling the taste buds’. It is the gustatory system that mediates this culinary experience.

Tongue and mouth

Taste buds are a collection of receptors configured for particular molecules. The receptors are located on papillae on the tongue and these papillae are the taste buds.

There are four basic tastes that these receptors mediate: salty, sour, sweet and bitter:

- Salt (or sodium Na^+) passes readily through Na^+ channels and depolarises the cell – thus salt directly activates an action potential.
- Sour tastes are produced by acidic substances. Acidic substances release a hydrogen ion that blocks K^+ channels. Blockade of K^+ channels stops the release of K^+ and the ionic imbalance that is created leads to depolarisation of the cell and an action potential.
- Bitter and sweet tastes are mediated by G-protein linked receptors. On stimulation by a sweet or bitter taste, a second messenger is released before depolarisation. Taste buds have a short existence and are constantly being replaced.

The brain

Three cranial nerves carry the signal from the taste buds. The facial nerve carries information from the anterior of the tongue, the glossopharyngeal nerve carries messages from the posterior portion of the tongue and throat and the vagus nerve carries information from the lower part of the throat.

All three cranial nerves project to the nucleus of the solitary tract, which passes the information to the ventral posterior medial nucleus of the thalamus. The thalamic nuclei pass the signal on to the primary taste cortex in the frontal lobe.

The red hot chilli pepper

Of course, taste is not the only delight for which the mouth is responsible. Capsicum (better known as the chilli pepper) can produce pain. The mouth contains receptors that respond to painful stimuli and temperature. Caterina et al. (1997) identified the capsaicin receptor, which is heat activated. For those who like chilli, one of the interesting findings from this study was that the habañero pepper is the most potent. The message from these heat-sensitive receptors is transmitted via the trigeminal nerve to the brain and the pain pathways.

Self-test: Do all the senses go via the thalamus?

The vestibular system

The vestibular system detects changes in the position of the head and changes in gravity. It is located next to the cochlea in the inner ear, and comprises the utricle, the saccule and three semicircular canals (see Figure 11.14).

The utricle and saccule respond to static positions of the head, while the semicircular canals – which are at 908 to each other – detect motion. The receptors in the vestibular system, as in the ear, are hairs; movement of fluid acts on these hairs and produces action potentials.

The vestibular system relays information down part of the auditory nerve and synapses at the vestibular nucleus.

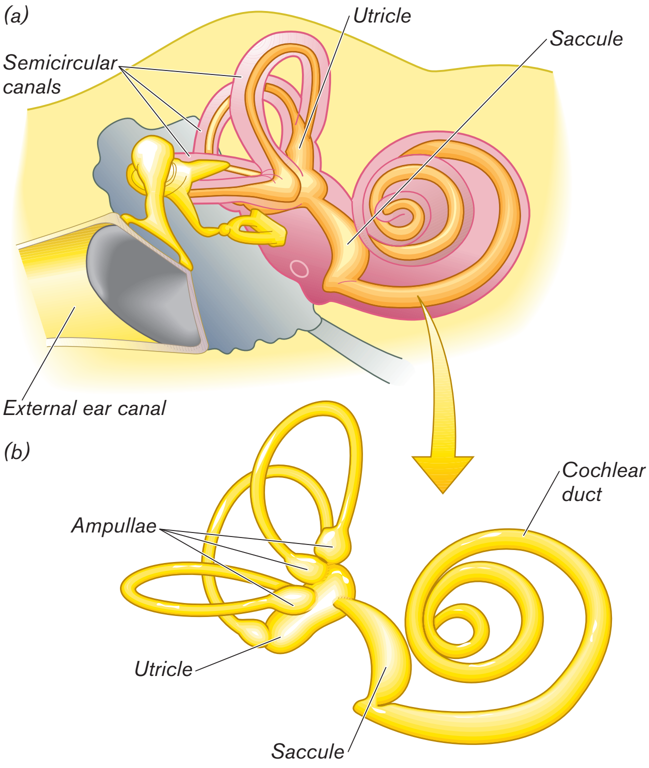


Figure 11.14 The vestibular system

Projections from the vestibular nucleus are diffuse and connect with many areas of the brain (e.g. the thalamus, the cortex and other motor areas like those that innervate the eye muscles).

Self-test: What does the vestibular system do?

Motor control

The brain and the sensory modalities are not just passive recipients of incoming signals – the signals that are received are acted on. They may be acted on as reflexes or as motor programmes and a large area of the brain is concerned with motor control.

Regions of the brain

There are two regions of the brain that control two motor pathways. There is a great deal of communication between the two. The pyramidal motor system starts at the primary motor cortex, which is responsible for fine motor programmes. The extrapyramidal system projects from a number of brain regions: the cortex, cerebellum, basal ganglia, reticular formation and the thalamus.

The pyramidal system

The primary motor cortex is located in the frontal lobes. It communicates information to the secondary motor cortex. The secondary motor cortex comprises the premotor and supplementary motor area (SMA) and the secondary motor cortex receives information from the association cortex – the latter of which receives sensory inputs.

The primary motor cortex sends messages to the muscles via efferent fibres. The muscles respond, permitting fine motor movement like writing.

APPLICATIONS BOX 11.1

Further destruction of the brain can be beneficial to patients with Parkinson's disease

We saw in Activity Box 7.2 how the architecture of the basal ganglia operates when there is a loss of DA in the substantia nigra. Most therapies for Parkinson's disease have sought to replace the deficit.

Would you consider destroying another part of the brain as a treatment?

Your answer is probably no. It is counterintuitive to treat neurodegeneration with further destruction. However, this is exactly what happens when a patient receives a pallidotomy. A pallidotomy is the destruction of the globus pallidus.

Why should this work?

Gerfen (1995) states that there is an increase in activity in the striatopallidal system (the striatum to the globus pallidus) in relation to the striatonigral system (striatum to substantia nigra) in Parkinson's disease.

If the globus pallidus is overactive in Parkinson's disease, then damping down its effect may be clinically effective. A lesion of the globus pallidus is a dramatic way of achieving silence from the globus pallidus. After pallidotomy, 81 per cent had relief from tremor and improvement of gait (Laitinen et al., 1992). Ten years after surgery there was still a marked improvement (Hariz and Bergenheim, 2001).

The improvements seen after pallidotomy may arise as a result of the patients being able to tolerate higher doses of therapeutic drugs due to a reduction of side-effects (Dogali et al., 1995). Even with this consideration, namely that the pallidotomy is not a cure, the benefits remain for at least a year (Baron et al., 1996).

PET measures of regional cerebral blood flow before and 17 weeks after pallidotomy show increased activity in the supplementary motor area and the premotor cortex (Grafton et al., 1995). This indicates that the motor circuits of the basal ganglia are being reactivated to some extent because they are seen to be busy once again.

The extrapyramidal system

The extrapyramidal system receives input from the primary motor cortex and the SMA and communicates with a diverse set of structures to control gross motor movements. There are two key areas in the extrapyramidal system: the basal ganglia and the cerebellum.

The basal ganglia

The basal ganglia are a group of subcortical structures that receive information from the cortex. There are a number of routes through the basal ganglia, but essentially they all start at the SMA and go back to the cortex via the thalamus. The role of the basal ganglia is to modulate the motor programmes of the pyramidal system.

The implications of a dysfunction of the basal ganglia are clearly evident in Parkinson's and Huntington's disease. An increase in our understanding of the architecture of the basal ganglia has given rise to surgical treatment for Parkinson's disease (see Applications box 11.1). Huntington's disease is a result of degeneration of the striatum (Calabresi et al., 2000) and produces abnormal involuntary movements.

The cerebellum

The cerebellum receives sensory input and information from the pyramidal and extrapyramidal systems to coordinate responses and is important in modifying fine motor movement, posture and the learning of new motor sequences. Damage to the cerebellum can have numerous effects on motor behaviour (such as ataxia, which is the inability to walk in a coordinated manner).

Passage of information to muscles

The aim of the descending motor pathways is to control movement, by influencing muscles. Neural messages are communicated at the neuromuscular junction (NMJ) and at the NMJ the action potential releases acetylcholine (ACh). The muscles react to ACh via nicotinic and muscarinic receptors, producing further action potentials.

Returning information

The whole process of receiving sensory input and acting on it is a sensorimotor loop. The muscles, whether of the arm or the eye, send back information that helps guide motor programmes. The information is integrated with other sensory modalities. How we interact with our environment is down to afferent and efferent control.

Self-test: How is movement controlled?

Summary

As an organism, we receive a wealth of information from our environment via our sensory modalities. The senses are the tools for receiving information; it is the brain that interprets the input.

However, we do not merely receive information, we also act on it. The motor system allows us to be far more than passive recipients of sensory input – it enables us to interact with the environment. Between the perceptual systems and the motor systems there is a great deal of cross-communication.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the visual system in detail.
2. Describe the auditory, somatosensory, gustatory and olfactory systems.
3. Provide an account of pain.
4. Describe the neural mechanisms underlying motor response.

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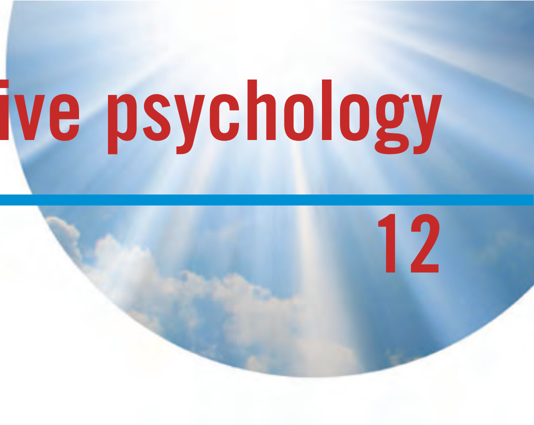
sectionthree

Christopher Sterling

Cognitive psychology

12 Perception 151
13 Attention 169
14 Memory 183
15 Language 204
16 Thinking and reasoning 218



12

Perception

Route map

The aim of this chapter is to introduce students to some of the important issues in the psychology of perception. It begins with a discussion of the major issues to do with the perception of form. These are referred to as the figure–ground problem, the perceptual constancies and visual illusions. Next we look at how we perceive depth and the three sections after that deal with the perception and recognition of patterns and objects. These are followed by a discussion of bottom-up and top-down processes in perception. The chapter concludes with a description of some of the processes involved in speech perception.

Introduction

Imagine you are looking out from a high building and that a large part of a town is spread out in front of you. The buildings are crowded together but you have no problem separating them from each other. You know which are close by and which are far away. People are walking on the pavement beneath and you know that they are people even though they are as small as ants. Streams of cars and buses drive by and even from your lofty position you have no trouble distinguishing between them – in fact, you can easily recognise different makes of car. A person walking by looks familiar. You recognise their walk and build. They look up and you confirm that it is a colleague.

How does your brain work all this out from such a crowded scene? This chapter begins to explore some of the processes that comprise our perception and recognition of the world.

We have five senses: sight, sound, touch, smell and taste. In this chapter, we are concerned mainly with visual perception and the role it plays in cognition. The other sensory modalities are covered in Section 2 of this book, on psychobiology, partly because most of the research in these modalities is on sensation and partly because the complexities of perception have been most extensively investigated in vision.

Researchers distinguish between the distal stimulus and the proximal stimulus. The distal stimulus is what is out there in the world – the object you are looking at. The proximal stimulus is the pattern of stimulation that hits the retina. While the distal stimulus is invariant, or constant, the proximal stimulus varies, often quite considerably. The book you're looking at remains constant and unchanging regardless of when you look at it, but the image it casts on your retina will change with angle of view, with distance from it and with changes in light intensity and colour. A major issue for perception is how your perception remains constant when the proximal stimulation is so variable.

Researchers also distinguish between sensation and perception. Generally, sensation is concerned with the quality of stimulation. How bright is a light? What colour is an object? Is this weight heavier than that weight? Can you see the gap between those two lines or do they appear as one line? Early researchers were very concerned with these kinds of questions and developed a discipline called psychophysics.

The goal of psychophysics is to measure the psychological effects of the physical stimulus. One aspect of this is concerned with determining sensory thresholds. How bright does a light have to be before it is detectable? How loud does a sound have to be before it is audible? Psychophysics is also concerned with how we respond to change in sensory stimulation. If the intensity of a light (measured in physical units) is doubled, will you see it as being twice as bright? What is the smallest change in volume of a sound that you can detect? Investigations of all these questions have to do with the relationship between the physical stimulation and the psychological sensation (see Chapter 11).

Perception is concerned with more complex questions. How do we separate one object from another when they're close together or overlapping? How do we see the shape of an object? How do we perceive the three-dimensional nature of the world when the image falling on the retina is two dimensional? Does our past experience affect how we see the world? These questions will be addressed in the course of this chapter.

Perception of form

Figure–ground separation

No matter how crowded a scene, we always seem able to separate the objects in it from each other and from the background. This is called figure–ground separation. We take our ability to do this for granted but a little reflection reveals that it is not a trivial matter. The Gestalt psychologists Koffka (1886–1941), Kohler (1887–1968) and Wertheimer (1880–1943) made up a group of German practitioners who fled to the USA before the Second World War. They formulated several ***laws of perceptual organisation*** that contribute to our understanding of how this is done. These psychological principles identify cues that help the brain to put the pieces of a visual scene together in an appropriate way. They provide the basis on which the perceptual system organises the lines, edges and surfaces in a complex scene into separable wholes. Thus if you look at Figure 12.1 you can see a number of separate whole objects, not just a random collection of lines.

There are a number of these laws of perceptual organisation. One is the proximity principle. This holds that surfaces or edges that are close together are more likely to belong to the same object than those that are far apart. This can be seen in both Figure 12.1 and 12.2b.

Another is the closure principle. This refers to the fact that we tend to complete incomplete forms and generally ‘fill in the gaps’. In Figure 12.2a you can see complete figures rather than incomplete ones.

A third principle is the similarity principle. This is where similar parts of a form are more likely to be perceived as belonging together than parts that are dissimilar. In Figure 12.2c you can see vertical bars, not horizontal ones.

Yet another is the ***continuity principle***. We tend to group stimuli into forms that follow continuous lines or patterns. So we tend to see Figure 12.2d as being composed of two intersecting lines rather than as two angular patterns.

Self-test: What are the Gestalt principles of perceptual organisation?

The constancies

An important characteristic of perception is the tendency to see shape and size, as well as brightness and colour, as being constant across changes in the proximal stimulus. This psychological invariance across physical changes is referred to as the ‘constancies’. Shape constancy refers to the phenomenon of the shape of an object remaining constant even though the outline it throws on to the retina depends on the angle from which it is seen (see Activity box 12.1).

Another constancy is size constancy. This is the phenomenon that an object is perceived to be a constant size, regardless of how close or far away it is. This should not happen because a cue to the size of an object is the size of the shape it casts on the retina. A small retinal size indicates a small object, and a large retinal size a large object. Figure 12.3a illustrates this.

However, retinal size also depends on distance. A chair 10 metres away casts a much smaller shape on the retina than the same chair five metres away. Figure 12.3b illustrates this. So distance also affects retinal size. If retinal size were the only cue, we would perceive the chairs as being of different sizes. But we don’t. We perceive them as being the same size. This is size constancy.

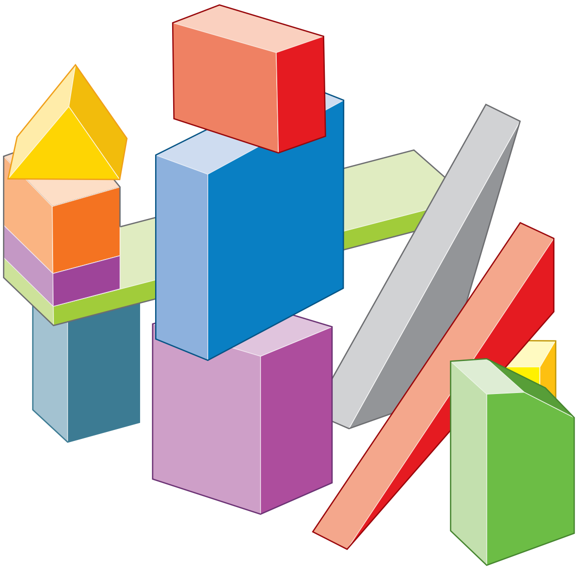


Figure 12.1 The perception of figure and ground: a crowded scene is viewed as a collection of objects, separated from each other and from the background
Source: Winston, 1970

ACTIVITY BOX 12.1

Shape constancy

Pick up a book. Hold it with the cover upright and facing you. You will agree that it is a rectangular shape with two long sides (of the same length) and two shorter sides (of the same length). The angles between the sides are right angles.

Now start turning and twisting the book through different angles and keep looking at the cover. You will see that opposite sides are no longer the same length and that the angles between sides are not right angles. The shape cast on your retina is no longer rectangular. However, at no time do you consider the shape of the book as having changed, regardless of the shape being cast on the retina. This is shape constancy.

Size constancy has been explained by the size–distance invariance hypothesis (Kilpatrick and Ittleson, 1953). This says that for a given retinal size (i.e. proximal stimulus) the perceived size is proportional to the perceived distance. In

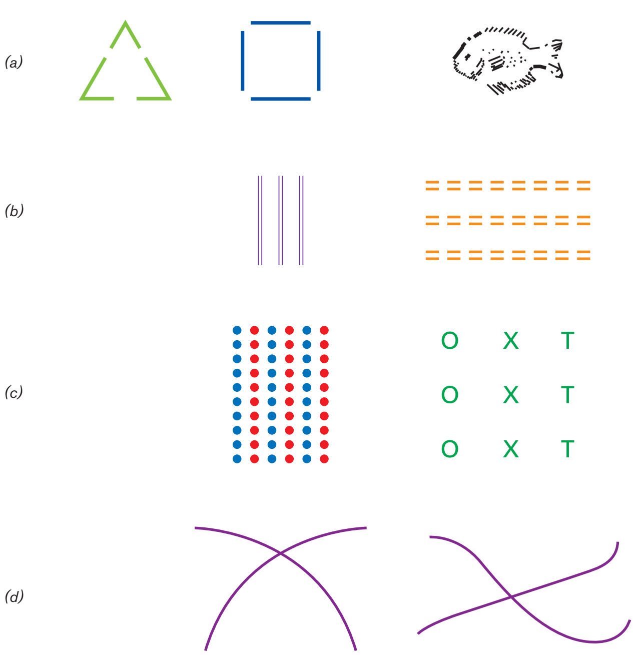


Figure 12.2 Illustrations of the laws of pragnanz: (a) closure; (b) proximity; (c) similarity; (d) continuity
Source: J. R. Anderson, *Learning and Memory: An Integrated Approach*, © 1995. Reprinted with permission of John Wiley & Sons, Inc.

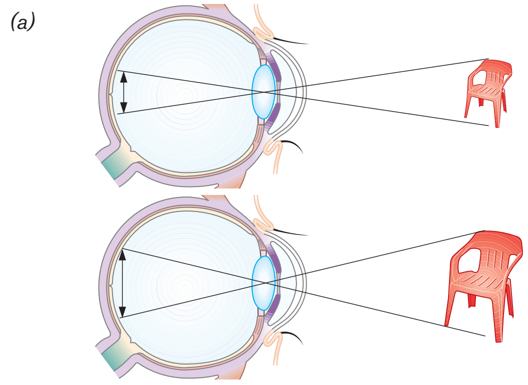
perceiving size, we take account of both the retinal size of the object and the perceived distance of the object. So if we perceive it to be far away we then compensate for the fact that the retinal size is small and perceive it as being of a normal size. If we perceive it as being close then we again compensate for retinal size, but in the opposite direction.

The Ames' room (see Figure 12.4) provides a startling demonstration of how perception can be manipulated and size constancy destroyed. The Ames' room is built so that it gives the impression of being a perfectly ordinary rectangular room to someone looking in from the outside. In fact, however, it is built so that the two distant corners, which seem equally far away, are not. One is much closer than the other. This distortion is disguised by other distortions such as a sloping floor. The end result of these distortions is that the room seems perfectly normal but is not. In particular, the two distant corners seem equally far away but are not.

The experimenter then introduces people of equal size into the room, one in each of the distant corners. The person in the closer corner seems much bigger than the person in the further corner because he or she casts a much bigger retinal image. If the room weren't distorted, the fact that he or she is closer would be taken into account and size constancy would hold. However, the room has been distorted to make the viewer think that the two people are equally far away. As a result, size constancy breaks down and the two people are seen as being of different sizes.

Other constancies are brightness constancy and colour constancy. A white surface, such as a white shirt, is seen as white, regardless of whether it is looked at in the sunlight

The size of the shape on the retina depends on the size of the object. The bigger the object the bigger the retinal size.



The size of the shape on the retina also depends on distance from the eye. A close object has a bigger retinal size than a distant object.

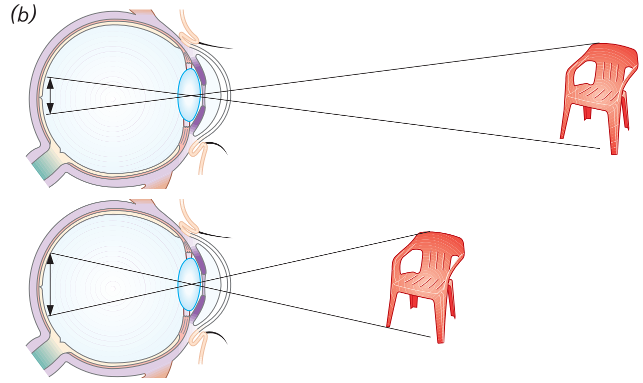


Figure 12.3 Retinal size as a function of (a) object size and (b) distance

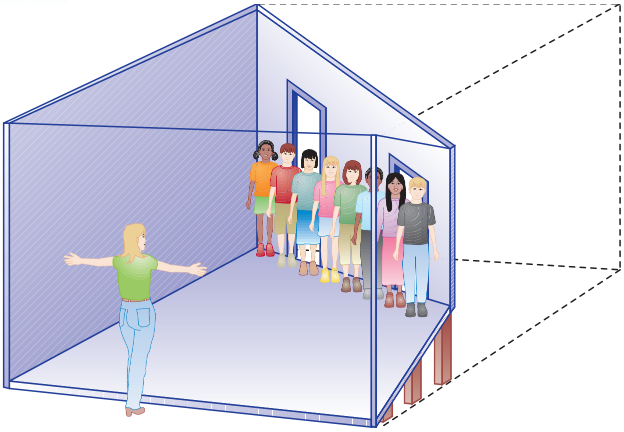


Figure 12.4 The Ames room: deliberate distortions in construction produce an illusion of size differences
Source: Sdorow and Rickabaugh, 2002: 153

or a darkened shop. This is brightness constancy. The fact that it does vary in brightness with the intensity of light can be seen by looking at it through a tube. Under these conditions, it goes from a bright white to a dull grey, depending on the lighting conditions. This suggests that brightness constancy is dependent on the context of the stimulus. When there are other objects for comparison brightness constancy holds, but when the basis for comparison is removed the constancy breaks down.

Colour constancy is very similar. A red object, such as a dress, continues to be perceived as red even though the brightness and/or colour of the ambient light may vary. The effect of context can again be seen by looking at the surface through a tube. When context is removed constancy breaks down.

The constancies provide evidence that our perception of the world is not dependent only on the relevant aspect of the stimulus. It depends on other aspects of the stimulus such as its perceived distance, its context and our knowledge of the world. We know a face doesn't change size and we know that a book doesn't change shape. This knowledge mediates the information from our senses, which is telling the brain that the size and shape of an object are changing. Consequently, the percept (the product of perception) remains relatively constant.

Self-test:

- What is a 'constancy'? What do the constancies tell us about the nature of perception?
- Explain the size–distance invariance hypothesis of size constancy.

Visual illusions

Visual illusions offer powerful examples of how perception can be wrong; of how what we see is not a veridical (truthful) reflection of what's out there. Even knowing about an illusion and trying to counter it offers no protection. In this section, we have selected two for closer

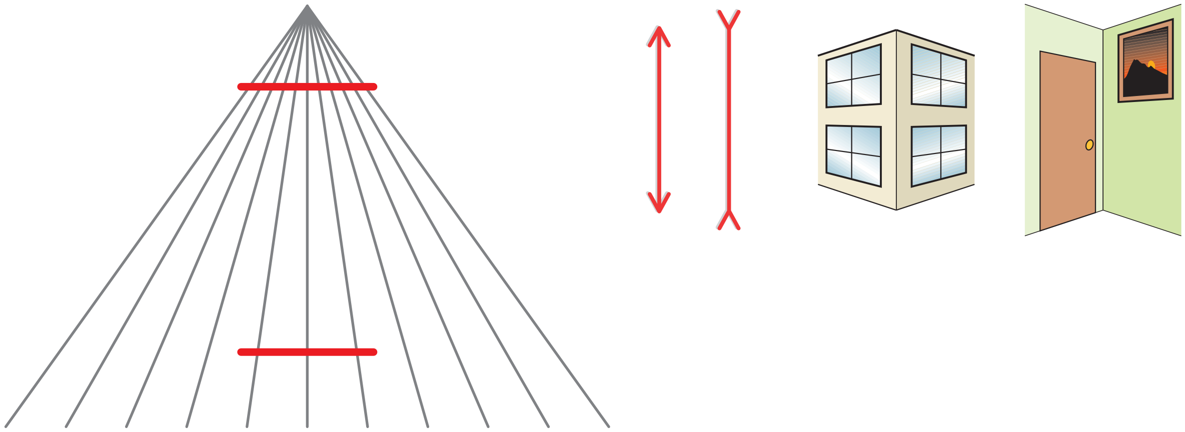


Figure 12.5 (a) The Ponzo illusion – the two horizontal bars are seen as being of different lengths when they are the same length; (b) the Muller–Lyer Illusion – the two vertical lines are seen as being of different lengths when they are actually the same.
Source: (a) Sdorow and Rickabaugh, 2002: 154; (b) Sdorow and Rickabaugh, 2002: 153

examination: the Ponzo illusion and the Muller–Lyer illusion.

In the Ponzo illusion (see Figure 12.5a) the two horizontal lines are exactly the same length (measure them with a rule) even though the lower line appears to be much shorter than the higher one. In the Muller–Lyer illusion (Figure 12.5b) the two vertical lines are again exactly the same length but one line (with the diverging lines at each end) appears longer than the other (with the converging lines at each end). Gregory (1972, 1980) has argued that these illusions can be explained by assuming that previous knowledge of three-dimensional objects is misapplied to these two-dimensional patterns. In other words, that perception is based not solely on the stimulus but also on other factors such as knowledge and experience of the world.

In the Ponzo illusion, linear perspective (see depth perception) is misapplied to the display. The two lines have the same retinal size so they should be the same size. However, the linear perspective created by the converging lines suggests that the top line is further away. If it has the same retinal size but is further away it must be bigger – that is, the illusion occurs because the perceptual system is (mistakenly) taking apparent distance in account.

In the Muller–Lyer illusion Gregory uses the same kind of argument. The left line looks like one of the outside corners of a building while the right line looks like one of the corners of a room from inside. The inside corner is, in a sense, going away from you while the outside corner is coming towards you. So the right line is perceived to be further away than the left line. The two lines have the same retinal size but one is perceived (mistakenly) as further away than the other. Thus the line perceived as being further away must be bigger. Illusions have been used by researchers such as Gregory to argue that perception is influenced by factors other than the stimulus – in these cases, by perceived distance and previous experience.

Self-test: What do illusions tell us about the nature of perception?

Depth perception

Depth perception is concerned with how we perceive the three-dimensional nature of the world. Objects are three dimensional. They have depth. They are also located at different distances from us. The problem lies in the fact that the image the world throws on our retina is two dimensional, flat, but we perceive the world in three dimensions. How do we do this?

Knowledge of the cues we use to perceive depth has accumulated over thousands of years. This accumulation is evident in the work of artists from Ancient Egypt to the present day. Psychologists are relative newcomers to this area of perception. In general, perception of depth depends on three types of cue: binocular cues, which depend on information from two eyes; monocular cues, which depend on information from one eye; and cues from the motion of the observer.

Binocular cues

One type of binocular cue is retinal disparity (see Activity box 12.2). We have two eyes, spaced apart by a few inches. Because of this separation each eye gets a slightly different view of the world. There is a disparity, or difference, between the two retinal images. The crucial fact is that when an object is far away the disparity is small but when the object is close it is large (see Figure 12.6a). So the degree of disparity between the two eyes is a cue to how far away the object is.

ACTIVITY BOX 12.2

Retinal disparity

Focus on a finger close to your face. Shut one eye and look at it with only your open eye. Remember the view you're getting of your finger. Now look at the finger with only your other eye. Note that this view of your finger is very different from the previous view. This difference is retinal disparity.

Now move the finger away from you and repeat these actions. As the distance increases the retinal disparity decreases.

A second binocular cue is binocular convergence. When the two eyes are focused on a distant object the eye muscles are less stressed than when they're focused on a near object. The difference in muscle tension is a cue as to the distance of the object. Distant objects cause less tension than near objects (see Figure 12.6b) (see Activity box 12.3).

Self-test: How do binocular cues enable us to perceive depth?

ACTIVITY BOX 12.3

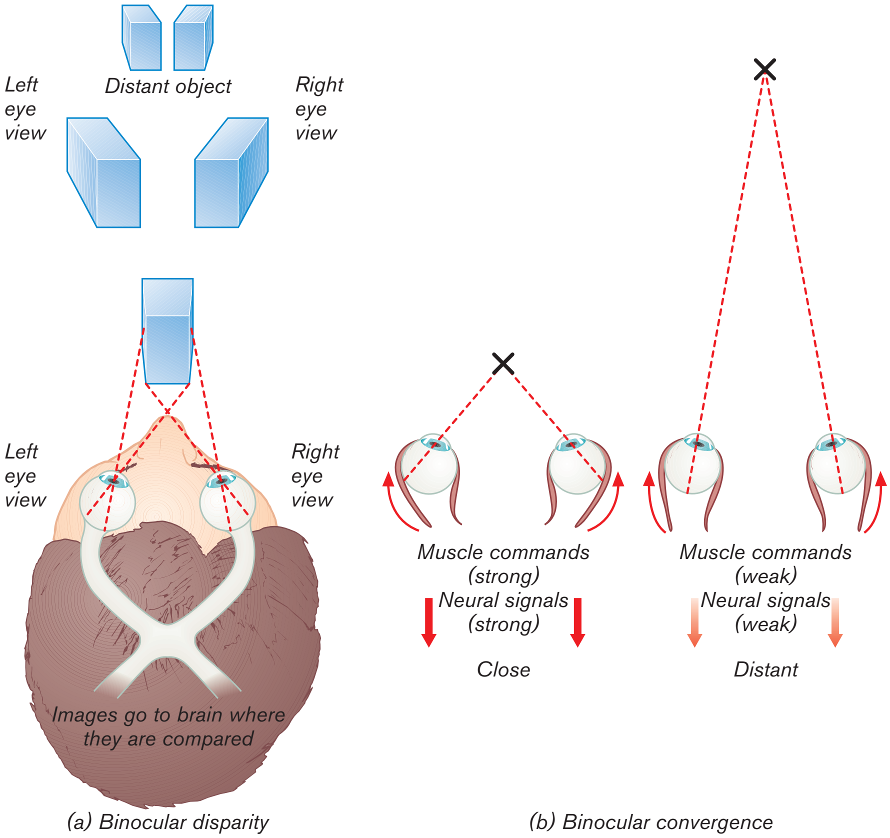
Binocular convergence

Focus on a distant object. The muscles responsible for swivelling the eyes in their sockets are relaxed and there's no feeling of strain. Now focus on a very near object (a finger inches from your eyes). Hold the focus for as long as you can. It becomes evident quite soon that the eye muscles are being stressed.

Although this activity exaggerates the difference, it does convey the idea that the degree to which the eye muscles are stressed is a cue to the distance of the object.

Monocular cues

Some cues to depth depend on only one eye for their effectiveness. Several cues have been identified. One is


Distant object
Left eye view
Right eye view
Left eye view
Right eye view
Images go to brain where they are compared
Muscle commands (strong)
Neural signals (strong)
Close
Muscle commands (weak)
Neural signals (weak)
Distant

(a) Binocular disparity

(b) Binocular convergence

Figure 12.6 (a) Retinal disparity: the difference between what each eye sees is a cue to distance. (b) Binocular convergence: a close object elicits stronger neural signals than a distant object.
Source: from STERNBERG, *Cognitive Psychology*, 2E. © 1999 Wadsworth, a part of Cengage Learning, Inc. Reproduced by permission. www.cengage.com/permissions

Photo 12.1 Interposition: the relative distance of the mountains in this scene is gauged by interposition; closer mountains partly obscure more distant ones.

Photo 12.2 Texture gradient: relative distance from the viewer can be gauged by texture gradient; the ‘grain’ caused by people’s heads becomes finer with distance from the viewer.

interposition. The relative distance of two objects is indicated by the fact that one object obscures the view of the second object because it is interposed between you, the viewer, and the second object. The obscured object is further away. This is clearly illustrated in Photo 12.1. All the mountains are far away but you know that some are closer than others because the closer ones partly obscure the more distant ones.

A second cue to distance is texture gradient. The term refers to the fact that the texture or graininess of a scene depends on distance. The texture of the foreground is very grainy, with large grains that are quite far apart. As you recede from the foreground the texture becomes less grainy, with smaller grains that are closer together. Thus the graininess, or texture, is a cue to distance from the viewer. In the next photo, you can see that the graininess resulting from people's heads in the foreground is coarser than that resulting from heads in the distance. Texture changes with distance from the viewer.

A third cue is linear perspective. This is a reference to the way that parallel lines converge as they recede into the distance. It is very evident in railway lines receding into the distance (see Photo 12.3). Less obviously, it's also present if you look at a rectangular box with the long sides pointing away from you.

The retinal size of an object is also a cue to distance. We discussed it earlier when talking about size constancy. An object that is close by throws a larger image on the retina than an object that is far away. The relative retinal size is therefore a cue to the distance of the object.

Self-test: How do monocular cues enable us to perceive depth?

Motion cues

Another set of cues to depth comes from the motion of the viewer. The first of these is motion parallax, which is only of use when you, the viewer, are moving. When you look out of a moving train you see that some objects are moving across your line of vision much faster than others. The 'faster' objects (e.g. the fencing and telegraph poles by the railway line) are those that are close by. The 'slower' objects (e.g. cows in a field, farm buildings) are those that are further away. This disparity in their relative movement is a cue that one is further away from you than the other. The faster one is nearer than the slower one.

Another motion cue to depth comes from the optical flow pattern (Gibson, 1950). James J. Gibson was an American psychologist who was an officer in the Army Air Corps during the Second World War. He developed his ideas while making training films for pilots (Reed and Jones, 1982). The following example, taken from Gibson (1950), reflects his background.

Look at Figure 12.7 and imagine yourself in a plane making a pass over the runway, heading towards a focal point on the distant horizon. As you speed towards this point the visual field ahead expands outwards from the focal point on the horizon. The environment is 'flowing' past you and the speed at which it flows depends on the distance from the focal point. This is shown by the length of the arrows. The parts of the ground and sky closest to you are moving the fastest, while the parts near the focal point (and furthest away) are moving the slowest. There is actually no motion at the focal point itself. So the optical flow of different parts of the environment as you move forward is a cue to depth and distance. (See Class activity box 12.1 for some problem-solving activities on this subject.)

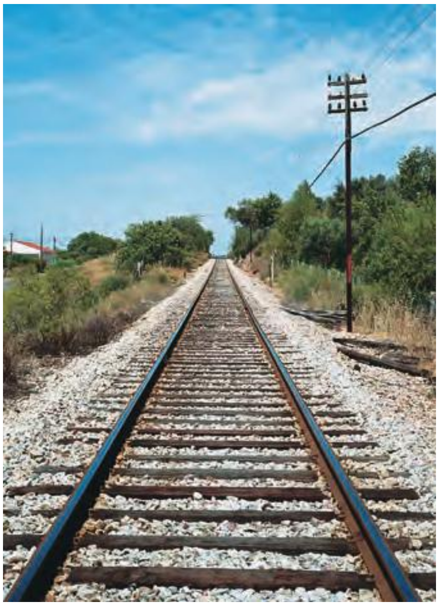


Photo 12.3 Linear perspective: the parallel lines of the railway appear to converge with distance from the viewer.

Self-test: How do motion cues enable us to perceive depth?

Pattern recognition

The laws of perceptual organisation tell us how we segregate objects. The constancies tell us that our perceptions are relatively invariant and illusions remind us that our perceptions can be mistaken. An important question is how we recognise a particular form for what it is (the letter A, a book, a picture of a tree)? In this section we consider several theories of pattern recognition. Implicit in these theories is that pattern recognition is a two-part process. First, there are perceptual processes that analyse the input and produce a percept. Second, there are recognition processes that identify the percept by looking for a match in memory. Evidence for this distinction comes from visual object agnosia (see Focus point 12.1).

Template matching

An intuitively appealing explanation of how we recognise patterns is offered by template matching theory (Selfridge and Neisser, 1960). This argues that we store templates of

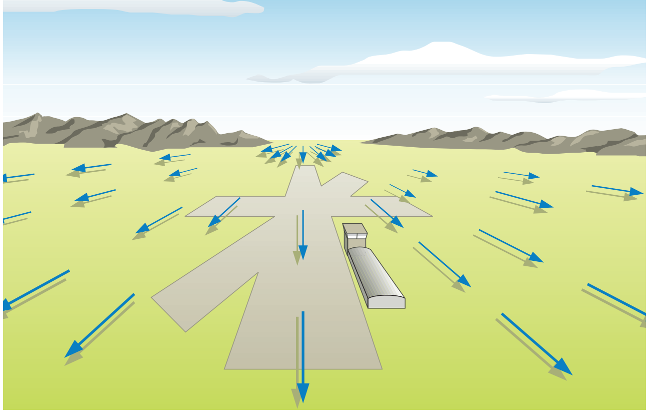


Figure 12.7 The optical flow pattern of a pilot flying towards the horizon: cues to depth and distance come from the relative speed at which different parts of the environment flow towards and past the flyer; distant points flow more slowly than nearer points

Source: Gibson, James J., *The Perception of the Visual World*. Copyright © 1971, 1950 by Houghton Mifflin Company. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company.

the various patterns we come across. So, for example, we have templates for each letter of the alphabet and each number (0–9). Whenever we come across a letter or number, the percept is compared with the store of templates and recognition occurs when a match is found. Figure 12.8a illustrates how an input 'A' would match a template 'A' in memory. However, Figures 12.8b, 12.8c and 12.8d show how a match could fail because of a change in position (b), of size (c) or of orientation (d).

Although appealing, this theory runs into a number of problems. First, it implies a huge number of templates: one for each and every pattern we come across. This suggests a huge load on memory. However, we know that memory does have an enormous capacity and so this may not be a problem. Second, it implies a very time-consuming process in which each input is compared with thousands, even millions, of templates until a match is found. This is inconsistent with recognition being virtually instantaneous. However, Neisser et al. (1963) showed that participants could search for up to 10 target letters in an array of letters

CLASS ACTIVITY BOX 12.1

Perception

These exercises are designed for group work in seminars. They rely on the tutor being available to help and to discuss the purpose of the exercise and its implications.

The aims of these activities are to help you develop (1) an understanding of key topics in this area and (2) your expertise in simple experimental design. Work in groups and, in each case, restrict your design to one independent variable and keep the number of levels of the IV to two or three. Be aware that you may often need a control group. You may consult your lecture notes or any other information you have to hand.

1. Perceptual organisation. The Gestalt principles of perceptual organisation identify characteristics which seem to determine how we group stimuli. However, at what point does a particular principle 'kick in'? For example, in Figure 12.2a, how big do the gaps have to be for the perception of a triangle to break down? Furthermore, having found the size of gap at which this occurs can we identify a rule that characterises the relative size of the gap? For example, the perception of a triangle might break down when the size of a gap is some proportion of the length of one side of the triangle. Devise a simple experiment that would find the point at which a particular principle of your choosing (closure, proximity etc.) breaks down and the perception of grouping changes. *Hint*: think about varying the basis of grouping slowly and in small increments:
    1. Name the independent variable.
    2. Identify your dependent variable and how it will be measured.
    3. State briefly, if possible, what you might expect to find and why?

2. Gibson argues that we perceive forward motion directly from the optical flow. An interesting question is how good we are at estimating this forward speed. Our ability to estimate 'time to contact' is, of course, crucial for road safety. Imagine you are a psychologist hired by the government to find out how good people are at estimating forward speed and time to contact. Assume access to a driving simulator:
    1. Design a simple experiment to answer this question.
    2. Name the independent variable.
    3. Identify the levels of the independent variable.
    4. Identify your dependent variable and how it will be measured.
    5. State briefly what you might find and why.
    6. Draw a hypothetical graph of the results.

answers at the end of the section

FOCUS POINT 12.1

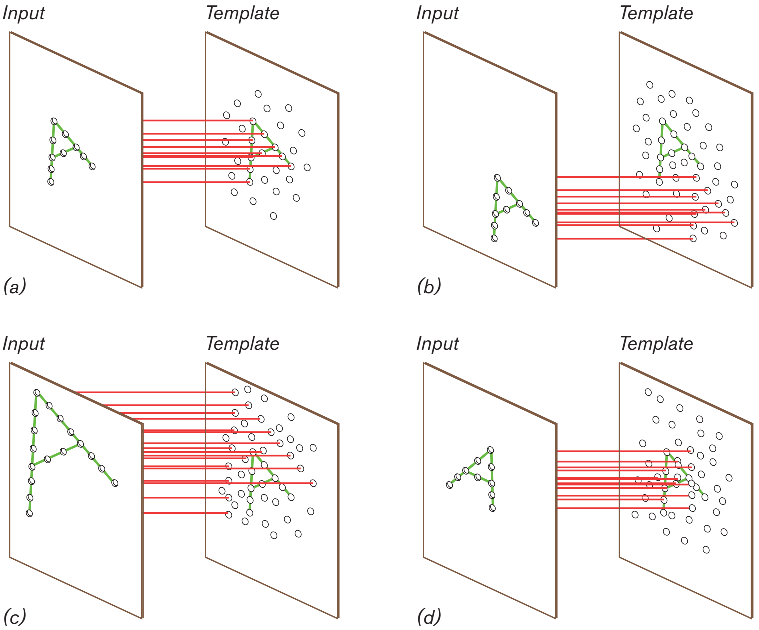
Visual object agnosia

Agnosia means not knowing. Object agnosia means not knowing objects. Visual object agnosia means not knowing objects presented visually. Some people with brain damage suffer from visual object agnosia. The precise nature of the problem varies from patient to patient (people don't have head injuries to suit the convenience of neuropsychologists!), but a useful distinction has been made between apperceptive agnosia and associative agnosia (Lissauer, 1890–1988). This distinction reflects a distinction in normal object recognition between perceptual processes and memory processes. The end result of perceptual processes is the percept: a representation of the object but no knowledge of what it is. For recognition to occur, this percept has to be used in a memory search to find an appropriate match.

In apperceptive agnosia the person cannot recognise familiar objects (tables, chairs, books etc.) because of a perceptual impairment. This is reflected in the person's difficulty or inability in copying a simple line drawing. She or he can, however, draw the object from memory. In some cases she or he can't point out a shape in a busy picture or recognise an object from an unusual angle (a bus seen from above) or in poor lighting conditions (heavy shadows). Processes that act together to produce a percept have broken down. However, the person can recognise these same objects when presented through the other sensory modalities (i.e. recognising a dog from its bark, or a book from its touch).

H.J., a patient reported by Humphreys (1999), couldn't recognise his wife when she was standing in front of him but could recognise her when she moved or when she spoke. This indicates that fundamental information about the object is present in memory but is not accessible through vision because visual perception is impaired. For an interesting and readable account of H.J., see Humphreys (1999).

In associative agnosia the failure to recognise common objects occurs because of a memory problem. The perceptual processes that produce the percept are intact. An ideal characterisation would be like someone with normal perception looking at an object they had never seen before. The person is able to copy simple line drawings and can match copies of the same picture but they can't draw the object from memory. In some cases the person is able to recognise the object through other modalities because the damage is to a connection between perception and memory. In other cases the damage is more widespread and the information is lost to all modalities. For a readable account of an associative agnosic called Dennis, see Riddoch and Humphreys (1992).



Problems of template-matching. (a) shows an input that matches the template; (b) a mismatch due to change of position; (c) a change of size; (d) of orientation

Figure 12.8 Template matching: the pattern, a letter A, matches (a) or fails to match a stored representation of A depending on the (b) position, (c) size and (d) orientation of the pattern
Source: Neisser, 1964: 51

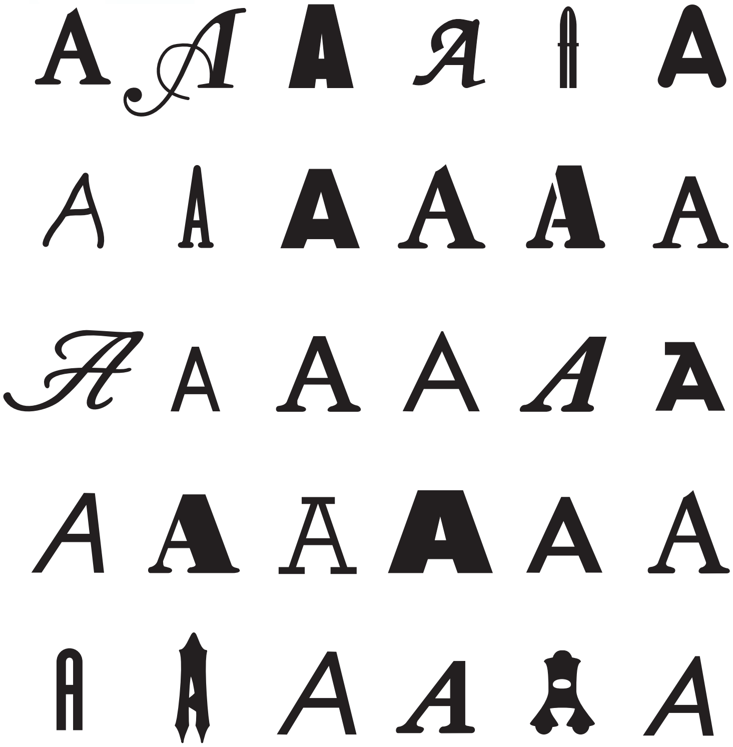


Figure 12.9 Variations of the letter A: these examples of the letter A are very different from each other but all recognisable as As; they illustrate a problem faced by template-matching models of pattern recognition
Source: Solso, 1998: 108

as quickly as they could search for one letter. This suggests that comparisons between the letters in the array and the templates can be done in parallel (with several comparisons made simultaneously) rather than in serial (one comparison at a time) so this may not be a problem.

However, a serious problem is that stimuli like the letter A can be written in different fonts, handwriting styles, sizes and orientations (see Figure 12.9). We can't possibly have a template for each variant. The problem can be partly overcome by a 'clean-up' of the stimulus in pre-recognition processing. This would standardise the stimulus in terms of the font, the size, the orientation and the general appearance of the stimulus. This prepared stimulus would then be ready for template matching. (See Focus point 12.2 for a special case of feature recognition.) However, there is a problem with this clean-up proposal (see Activity box 12.4).

The logical problem posed by pre-recognition clean-up can be reduced by context in some, but not all, circumstances. You can see from Figure 12.12 that the letter between C and T could be an H or an A. The context resolves the ambiguity.

Self-test: What is a template? What is the main problem of the template theory of pattern recognition?

Feature theory

An attractive replacement for template theory is feature detection theory (Neisser, 1967). According to this theory, each pattern can be specified in terms of a list of distinctive features that together make up the pattern. There is a detector for every feature.

You can see from Table 12.1 that patterns, letters in this case, can be specified in terms of a list of features. This list can then be compared with feature lists stored in memory (one for each pattern) and when the input list matches a memory list the pattern is recognised. There is very good biological evidence for the existence of feature detectors in the visual system. Hubel and Wiesel (1963) and other researchers have identified single cells that respond selectively to stimulation from edges, bars and corners that are in particular orientations and in particular parts of the visual field (see Research methods box 12.1).

Another source of evidence for the existence of features comes from visual search experiments. Neisser (1964) showed that looking for a target letter that consists of straight lines and sharp angles (e.g. Z) in an array of similar letters (e.g. A, H, N, L, T) is harder than looking for it in an array of letters with more curved features (e.g. C, Q, G, O, S). You can confirm this for yourself by doing the exercise in Activity box 12.6. In the first case, the features of the target and background are less similar than in the second case.

While the idea of feature detectors is both plausible and supported, it is not clear how the features are put together. A feature list consists only of the features present. It does not contain information about the spatial relationship

FOCUS POINT 12.2

Face recognition

A special case of pattern recognition is face recognition. How do we recognise familiar faces? Are familiar and unfamiliar faces processed differently? These and other questions have received (at least) partial answers from an influential model by Bruce and Young (1986). A particularly interesting aspect of the model is that it has been developed largely on the basis of neuropsychological research and the use of 'double dissociation' methodology (see Chapter 14).

How do we recognise a familiar face? According to the model there is an initial stage of perceptual processing that produces a percept that is expression-independent (i.e. the expression on the face doesn't influence recognition). This percept goes through to a 'face recognition unit'. There is a unit for every face you know. If processing stopped at this point you would be left with a feeling of familiarity but nothing else – you wouldn't know anything about the person. The information from here then feeds through to a 'person identity unit', which does have information about who the person is (i.e. a lecturer from college). Again, if processing stopped here this is all you would know – you wouldn't know his/her name. Finally, this information feeds through to the 'name unit', where the person's name is available.

Harder evidence for the model comes from studies of head-injured patients with prosopagnosia (an inability to recognise familiar faces). First, there is evidence that some prosopagnosia is due to a perceptual deficit (in the perceptual processing unit) rather than to a memory deficit (in the face recognition, person identity or name units).

One patient, called Unteroffizier S. and who was prosopagnosic after being wounded in the head during the Second World War, said that the faces of people he looked at all looked the same and like flat white oval plates with emphatically dark eyes (Bodamer, 1947, cited in Ellis and Young, 1995). He didn't recognise his mother in a chance meeting, or his own face when he and several others were looking in a mirror! On the other hand, a patient called Mr W. had no significant perceptual impairment. He could copy faces, identify gender and age, and classify expressions correctly. Nevertheless, when their hairstyles were covered up, he couldn't identify the faces of famous people, or himself, his doctor or a patient he was friendly with (Bruyer, LaTerre, Seron, et al., 1983, cited in Ellis and Young, 1995). His problem lay in the face recognition units and stages following.

Evidence that naming a person is a separate ability comes from a patient, G.L., who when given 20 photographs of familiar people could describe who they were (e.g. politician) but couldn't name them.

Finally there is some evidence that the ability to recognise faces is distinct from the ability to recognise other objects. De Renzi (1986) reports a patient who had severe prosopagnosia but could recognise other things, such as his belongings, his handwriting, his own car in the car park and Italian coins from other coins.

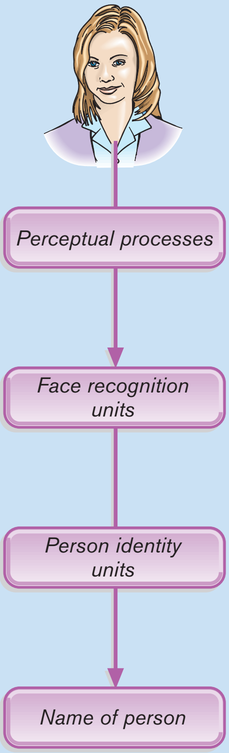


Figure 12.10 Part of Bruce and Young's (1986) model of face recognition: after a perceptual analysis, face recognition, person identity and name units are activated by the input, resulting in full recognition.

ACTIVITY BOX 12.4

The problem with the clean-up proposal

Question: What is wrong with the proposal that poor As can be cleaned up to produce a standard A, which can then be compared with templates until a match is found?

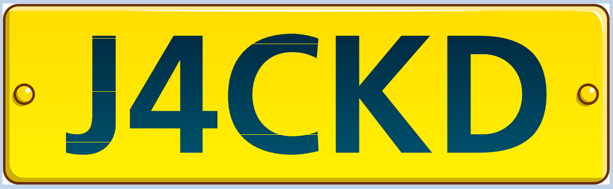


Figure 12.11 A personalised number plate

Answer: The problem is a logical one. How can pre-recognition processing prepare an A properly for matching until it knows that it's an A?! A badly written 4 could be mistakenly cleaned up and presented as an A. Mistaken identification is not a rare phenomenon. Indeed people often depend on the similarity between a 4 and an A to personalise their car number plates (see Figure 12.11).

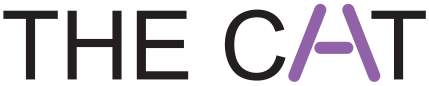


Figure 12.12 Letter identification and context

between the features. The same feature list can be put together in several ways (see Figure 12.15). A structural description of the percept is necessary to specify how the features are to be combined and it is not at all clear how this is done, although the laws of perceptual organisation may play a part.

Self-test: What is a distinctive feature? What is the main problem of a feature theory of pattern recognition?

Object recognition

Patterns are two dimensional. Objects are three dimensional. While the basic idea of a feature carries over very well to object recognition, the theory needs modification to cope with the three-dimensional world. Marr (1982) proposed a theory that was specified in

RESEARCH METHODS BOX 12.1

Biological evidence for feature detectors

Technological advances in the 1950s and 1960s allowed scientists to measure the firings of single cells in the brain. David Hubel and Torsten Wiesel were awarded the Nobel Prize for their work on this in 1981. (See Chapter 11 of this book for further details of the biological aspects of their work.)

Hubel and Wiesel's research (1963; 1968; 1979) measured single cell responses in the visual cortex. They found several types of cell. First, there were simple cells. Each simple cell responded to line segments (i) in a particular orientation in (ii) a particular area of the retina (i.e. the cell's receptive field). Each simple cell is therefore a detector for a very specific stimulus in a very specific location (see Fig. 12.13).

Further research revealed that several simple cells fed into a complex cell. Each complex cell responded to line segments in (i) a particular orientation (ii) located anywhere in the receptive fields of the inputting simple cells. Later research (e.g. De Valois and De Valois, 1980) identified hypercomplex cells, which responded to specific stimuli such as corners and angles. This neurophysiological research provides strong support for the notion of feature detectors.

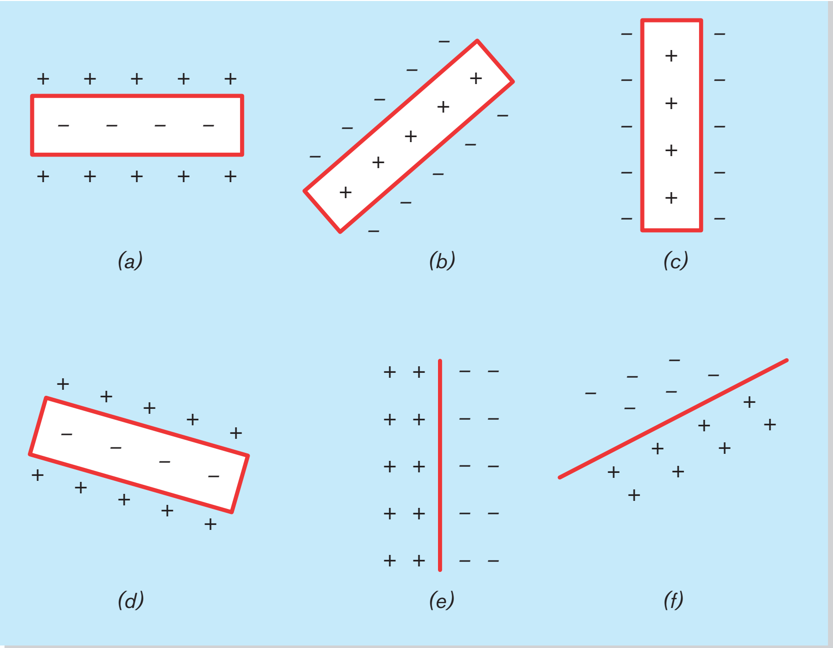


Figure 12.13 Receptive field of single cells in the cortex: areas marked + are excited by stimulation; areas marked – are inhibited by stimulation; in combination they respond to lines and bars falling on the retina

Source: from Kalat, *Biological Psychology*, 7E. © 2001 Wadsworth, a part of Cengage Learning, Inc. Reproduced with permission. www.cengage.com/permissions

TABLE 12.1 DISTINCTIVE FEATURES FOR SOME LETTERS OF THE ALPHABET

Letter	**Possible features**
A	— / \ Λ
K	| / \ |/ |\
Z	¯ / 7 L

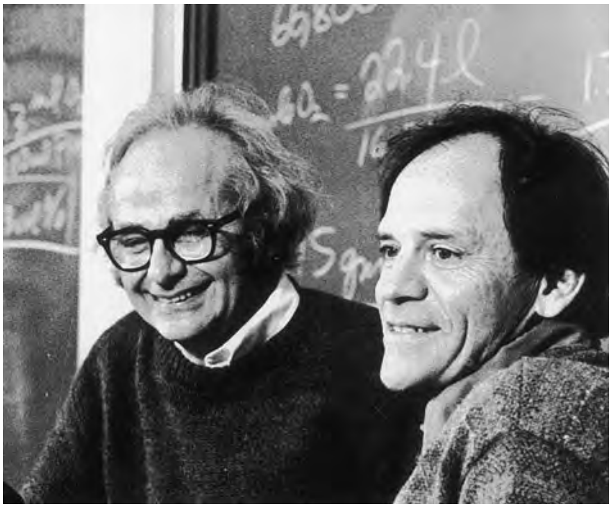
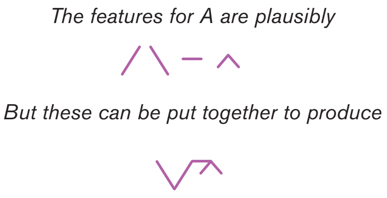


Photo 12.4 David Hubel and Torsten Wiesel, Nobel Laureates (1981) for their discoveries concerning information processing in the visual system.

sufficient detail to be simulated by a computer. According to Marr the brain computes depth in three stages. First, a 2-D 'primal sketch' based on basic sensory information that is two dimensional in nature and has information about lines, corners and regions of similarity (similar areas that, therefore, probably belong to the same object). It then creates a 2.5-D representation, which has some depth information such as texture gradients and binocular cues as well as the orientation of the object. The final stage is a 3-D model, which represents the three-dimensional nature of the object and the spatial relationships between the objects in the scene.

This theory influenced Biederman's (1987) recognition by components theory. The basis of this theory is the idea that objects consist of combinations of geons. Geons are three-dimensional building blocks, 'such as bricks, cylinders, wedges, cones and their curved axis counterparts' (Biederman, 1987: 314). There are a total of 36.

In the same sense that letters of the alphabet combine to make words, or features combine to make letters, so geons



The features for A are plausibly

But these can be put together to produce

Figure 12.15 Combining features in different ways

ACTIVITY BOX 12.5

Visual search

Look at Figure 12.14 and, using a watch with a second hand, time how long it takes you to find the letter Z in column 1. Note down the time. Now see how long it takes you to find Z in column 2. Again, make a note of the time it takes you.

What do you notice?

(a)	*(b)*
ODUGQR	*IVMXEW*
QCDUGO	*EWVMIX*
CQOGRD	*EXWMVI*
QUGCDR	*IXEMWV*
URDGQO	*VXWEMI*
GRUQDO	*MXVEWI*
DUQGRO	*XVWMEI*
UCGROD	*MWXVIE*
DQRCGU	*VIMEXW*
QDOCGU	*EXVWIM*
CGUROQ	*VWMIEX*
OCDURQ	*VMWIEX*
UOCGQD	*XVWMEI*
RGQCOU	*WXVEMI*
GRUDQO	*XMEWIV*
GODUCQ	*MXIVEW*
QCURDO	*VEWMIX*
DUCOQG	*EMVXWI*
CGRDQU	*IVWMEX*
UDRCOQ	*IEVMWX*
GQCORU	*WVZMXE*
GOZUCD	*XEMIWV*
GDQUOC	*WXIMEV*
URDCGO	*EMWIVX*
GODRQC	*IVEMXW*

Figure 12.14 Searching for Z in two arrays of letters
Source: Neisser, 1967: 70

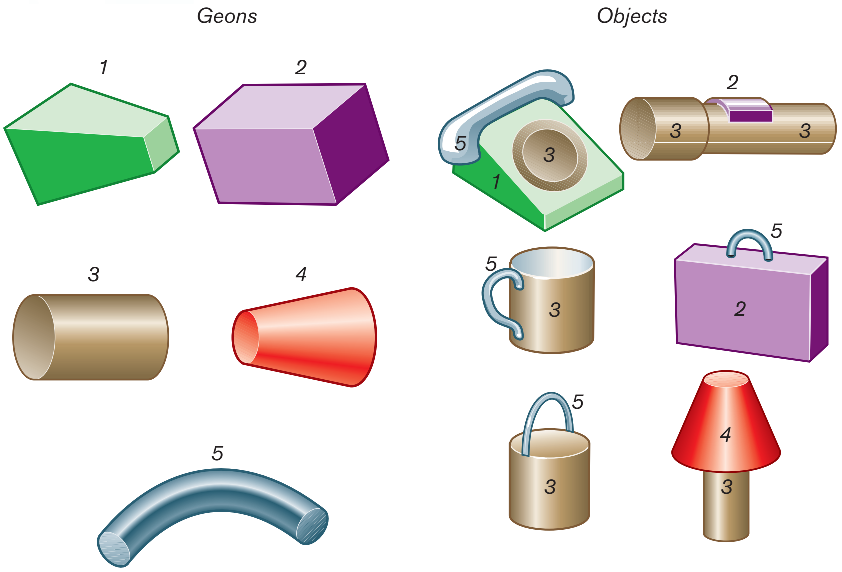


Figure 12.16 Geons and objects: Biederman argued that objects can be thought of as being composed of basic building blocks called geons
Source: Biederman, 1987

combine to form objects (see Figure 12.16). Thus object recognition consists of (1) segmenting the object into its component geons, (2) identifying these geons and (3) specifying the relationship between them for the given object. This structural description is matched to the contents of memory (also consisting of the same kind of information) and when a match is found the object is recognised.

You can see that the theory is very similar to feature theory, but translated to three dimensions. The relationship between features and geons is also plausible. Geons are themselves composed of features such as edges, corners, curves, and so on. The major problem with recognition by components theory is that there are many objects in the natural world that are not easily specified in terms of geons. A bush, the sea and a beach are three examples. Neither does it address the question of how we recognise specific examples of an object (the chair in my living room, as opposed to other chairs in other living rooms) or a face (my friend, John). It does, however, go some considerable way to explaining how we perceive the three-dimensional world.

Self-test: What is a geon? What is a major problem with the geon theory of object recognition?

Context

The context in which an object is seen can affect its perception. Palmer (1975) showed that recognition of the parts of a face – the nose, ears, eyes etc. – was clearly superior when these were presented as parts of a face than when presented in isolation. More detail was needed when they were presented out of context (see Figure 12.17).

The strongest, clearest evidence for context effects on perception comes from studies of word recognition, both visual and auditory. Studies of visual word recognition have shown that identifying a letter (e.g. k) is easier when it is presented as part of a word (e.g. work) than either in isolation (i.e. ___k) or as one of a string of random letters (e.g. rwok). This is called the word superiority effect and it shows that recognition of the letter is being affected by knowledge of the word in which it appears (see Research methods box 12.2). More of this in a moment.

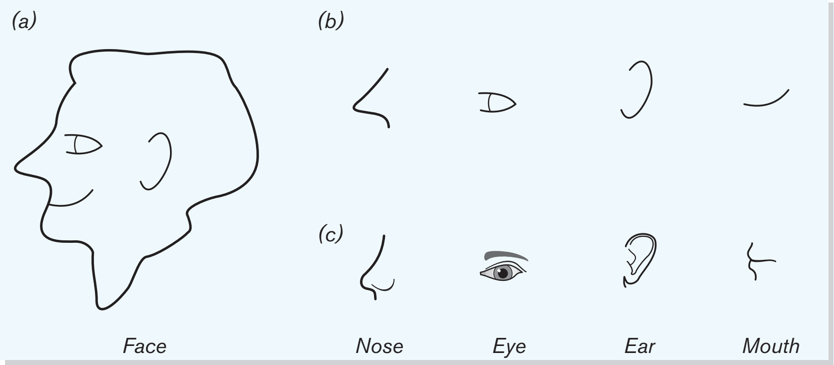


Figure 12.17 Facial features in and out of context: facial features are more recognisable in context (a) than out of context (b), unless they are very detailed (c)
Source: Palmer, 1975, published by the Psychonomic Society

A dramatic demonstration of top-down processing in auditory (speech) perception comes from the phoneme restoration effect. Phonemes are the component sounds of spoken words. Warren and Warren (1970) presented the following four spoken sentences to listeners:

1 It was found that the *eel was on the axle.
2 It was found that the *eel was on the shoe.
3 It was found that the *eel was on the orange.
4 It was found that the *eel was on the table.

[The * signifies a missing phoneme or sound.]

They found that the participants heard the *eel as wheel, heel, peel or meal, depending on the sentence they heard. They were 'restoring' the missing phoneme but were doing so with a phoneme that was appropriate to the sentence, indicating that context was influencing perception.

Bottom-up and top-down processes

An important debate about the nature of perception began in the middle of the last century. On one side were those such as J.J. Gibson, who argued that perception was *direct*. On the other side were equally eminent psychologists such as Bruner (1957), Gregory (1966) and Rock (1983), who argued that it was constructive. More current terms are bottom-up processing (direct perception) and top-down processing (constructive perception).

The bottom-up view argues that perceptual processes are driven entirely by the stimulus or input. There is enough information in the stimulus for us to perceive the complexities of the world without having to involve higher cognitive processes such as inference and knowledge of the world. The top-down view, in contrast, argues that the stimulus provides the basic working material, but that perceptual processes are heavily influenced by these higher cognitive processes. According to this view, perception involves forming hypotheses about the percept using the sensory data as well as knowledge and inference. Hence the use of the term 'constructive'. Another way of conceptualising the two views is to say that the percept is stimulus driven or is conceptually driven. Reviewing the chapter we find evidence for both points of view.

Gibson's work on depth perception (1950, 1966) is a good example of his theory of direct perception. He argued that all the information we need to perceive depth is present in

RESEARCH METHODS BOX 12.2

The word superiority effect

Experiments on word recognition using the technique outlined in Table 12.2 (p. 199) were first carried out by Reicher (1969) and Wheeler (1970).

Reicher (1969) found that performance in condition 1 was better than in conditions 2 and 3, which were the same. So letters in words are recognised better than letters in random letter strings (or on their own). This is the word superiority effect.

Subsequent experiments showed that letters in pronounceable strings (e.g. rowk) were also recognised better than on their own or in unpronounceable strings (Baron and Thurstone, 1973). This was called the pseudo-word superiority effect, and is further evidence of context effects. This time the benefit comes from the participant's implicit knowledge of the letter sequences permissible in English. These results suggest that (i) knowledge of the word and (ii) knowledge of the structure of English words influence the recognition of individual letters.

TABLE 12.2 WORD RECOGNITION TECHNIQUES

Condition 1	Condition 2	Condition 3
Present stimulus	Present stimulus	Present stimulus
work	___k	rwok
Present test display of alternatives	Present test display of alternatives	Present test display of alternatives
_ _ _ k _ _ _ d	_ _ _ k _ _ _ d	_ _ _ k _ _ _ d
Question: Which letter was in the original word?	Question: Which letter was in the original word?	Question: Which letter was in the original word?

the stimulus. Linear perspective and texture gradient are properties of depth in the same way that colour is a property of objects. They are invariants of a stimulus involving depth. Similarly, the pattern of optical flow remains the same whenever an observer is moving towards a point. It is an invariant of perception. The existence of invariants is, for Gibson, clear evidence that perception is direct.

The bottom-up approach is also implicit in some of the other theories we have reviewed. In template matching, the stimulus is matched to templates in memory and whether a match is obtained depends on the stimulus. Feature theory certainly focuses on bottom-up processes. Feature detectors are dependent on whether or not the given feature is present in the stimulus.

Finally, if we adopt the findings of Gestalt psychology, then the processes segregating objects from each other and from the background are bottom up. The cues of similarity, proximity and continuity are all present in the stimulus and are simply waiting to be decoded.

The evidence for top-down processes is equally compelling. It could be argued that linear perspective and texture gradient are cues to perception of depth inasmuch as the brain uses them to *infer* the depth and distance of objects. While template theory is consistent with a bottom-up view, recall that for template matching to work with everyday, 'dirty' stimuli, information about context would have to be used to render the input unambiguous.

Context effects are consistent with top-down processing. The experiments on word recognition provided the strongest evidence for how context, knowledge of words and the rules of English word structure affect the perception of single letters. Finally, the constancies and the existence of illusions are consistent with the idea that perception is based on more than only the properties of the stimulus, and that factors such as inference, experience and knowledge of the world play an important part.

Fortunately, a synthesis of the two views is both possible and convincing. Bottom-up processes are dominant early in processing when, for example, feature detectors are doing their work, while top-down processes operate higher up the system when identification and recognition (of often ambiguous stimuli) are at issue.

A good model of the interactive nature of perception is the interactive activation model of word recognition formulated by McClelland and Rumelhart (1981, 1986), much simplified here for ease of explanation (see Figure 12.18). In Figure 12.18, each circle represents a recognition unit in the brain. There are three banks of recognition unit: one for features, one for letters and one for words. When a word, say 'work', is presented visually the stimulus comes up against a bank of feature detection units. Those units representing features found in the stimulus are activated. The activated feature units, in turn, *activate* all letters containing these features (W, O, R, K) and *inhibit* activation of all other letters (A, B, C, D, etc.). Thus in Figure 12.18, A is inhibited and is less likely to be reported. The activated letter recognition units then *activate* all words containing the activated letters (and *inhibit* the activation of all other words). So far, relatively straightforward and a good example of bottom-up processing. However, if we stopped here, we would only partly be able to explain why the letter K is perceived more easily in a word than by itself. So, how does the top-down part work? As a result of the bottom-up processing the word 'work' is activated. This activation now feeds down to the letter recognition units and activate all letters contained in the word (W, O, R, K) and inhibits all other letters (A, B, C, D, etc.). Thus in Figure 12.18, A is inhibited and is less likely to be reported. This is how the top-down part words. The combination of top-down and bottom-up patterns of activation maximise the activation of the relevant units at the letter level. So, if K is presented by itself, only bottom-up activations can be used to identify it but if it is presented in the word 'work' top-down activation is also available. One last point, as explained here there appears to be only a bottom-up process followed by a top-down process but, in practice, there would be a reverberating pattern of activation.

Self-test:

- What does the word superiority effect tell us about the nature of perception?
- What is meant by bottom-up processes?
- What is meant by top-down processes?
- How does the interactive activation model take account of both bottom-up and top-down processes?

Summary

In this chapter, we have been concerned almost exclusively with visual perception. We began by looking at the

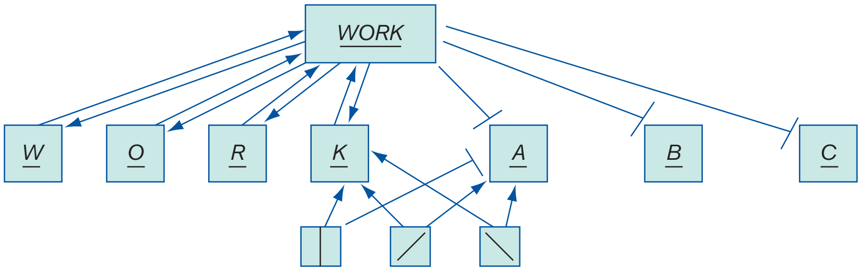


Figure 12.18 The interactive activation model of visual word recognition (McClelland and Rumelhart, 1981, 1986), simplified. → signifies activation; ⊣ signifies inhibition.

perception of form or whole figures, and examined the figure–ground problem, the constancies and visual illusions. We then looked at depth perception before moving on to pattern recognition. Here we looked at template and feature theories. The effects of context were seen in the next section, before we moved on to a brief consideration of the contrasting arguments of the bottom-up and top-down approaches and a model of how the interaction of top-down and bottom-up processes might work.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Outline major characteristics of the perception of form.
2. Describe how figures are separated from one another and from their background.
3. Describe the constancies and their origins.
4. Provide a tentative explanation of selected visual illusions.
5. Describe the different kinds of cue to depth perception.
6. Describe and compare major theories of pattern recognition.
7. Outline two theories of object recognition.
8. Describe the effects of context on perception.
9. Contrast bottom-up and top-down theories of perception.
10. Describe a model of interactive processes in perception.

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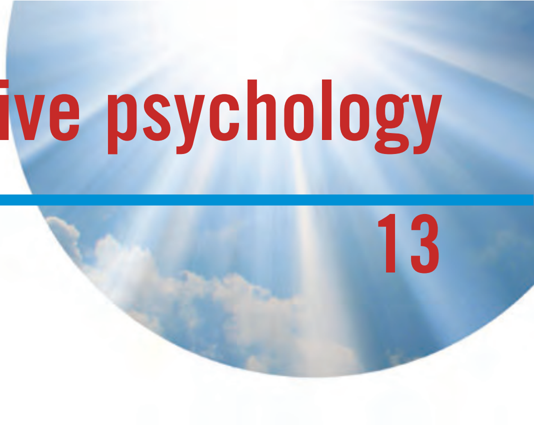

Cognitive psychology

13

Attention

Route map

The aim of this chapter is to introduce the reader to important aspects of attention. We will begin by looking at vigilance, which is the ability to sustain attention over a period of time. Next we'll examine characteristics and models of focused auditory and focused visual attention. The final section explores our ability to divide our attention between two tasks requiring simultaneous attention.

Introduction

We are constantly bombarded by stimulation. Even a simple scene presents our senses with a host of shapes, colours and sizes of objects and people. Consider a lecturer working in her office. She hears the roar of traffic outside, people talking in the corridor, doors slamming and the constant hum of a computer. She might be feeling thirsty and a little hungry. Memories – some personal, some work related – probably fill her mind. A number of problems probably need speedy solutions. Some may be obvious, others not. Students are lining up outside the door, colleagues are telephoning and emails are queuing up for response. How is it she doesn't get overwhelmed by these sights, sounds, memories and thoughts?

The answer is attention. According to Sternberg (1999: 69): 'Attention acts as a means of focusing limited mental resources on the information and cognitive processes that are most salient at a given moment.' Attention is usually, but not always, a conscious process. When our lecturer is looking at her computer screen or listening to a colleague, she is consciously directing her attention to the task in hand. She is focusing her attention and is aware of doing so. It is an intentional act. Similarly, when she divides her attention between taking a telephone call and replying to an email at the same time, there is a conscious effort to divide her attention between the two tasks. Finally, towards the end of the day, it probably takes conscious effort to keep focused on a particular task when the prospect of a drink with colleagues beckons.

By the same token, much of attention is not conscious in the sense that she may be aware of what she's doing but what she's doing is not under conscious control. She focuses consciously on the book she's reading, but the cognitive processes of reading are not conscious. They were once, when she was learning to read and rather painfully had to convert the letters to sounds and then blend the sounds. But no longer. She's listening to her colleague tell her about an incident in his lecture and this is conscious, but whatever is involved in listening to his voice and filtering out all the other sounds is not. When she drives her car home the sequence of actions to change gear is not something she thinks about now that she's a skilled driver. She's aware of needing to change gear but everything thereafter is barely in her awareness.

Psychologists have distinguished between controlled processes and automatic processes. As the earlier examples indicate, controlled processes require conscious control. They require intentional effort, full conscious awareness and attention. They operate quite slowly and usually do things serially, one at a time. In contrast, automatic processes do not require conscious control. They require little or no intention or effort and are usually outside conscious awareness. They need very little attention and can be performed rapidly and in parallel with other actions. This distinction between controlled and automatic processes, approximately congruent with the distinction between conscious and non-conscious and between needing and not needing attention, provides a context for the issues to be discussed in this chapter.

Self-test: What are the differences between automatic and controlled processes?

Vigilance

'Vigilance refers to a person's ability to attend to a field of stimulation over a prolonged period of time, in which the person seeks to detect the appearance of a particular target stimulus of interest' (Sternberg, 1999: 83). A vigilance task usually involves waiting for something unpredictable to happen. The classic example is of radar operators in wartime looking at their radar screens for missiles launched by the enemy. It might never happen, but the fact that it might means that they have to be on alert constantly.

Jobs involving vigilance have become increasingly rare with the advance of technology. Whereas industry once employed people to sit on production lines looking for faulty goods they now have robots to do the same job, usually more efficiently. Nevertheless, when vigilance is required it is usually of crucial importance, as in the case of air traffic controllers (see Activity box 13.1).

ACTIVITY BOX 13.1

Signal detection theory

Do the online experiment at http://epsych.msstate.edu/deliberate/index.html

Studies of vigilance have revealed that the ability to detect an event is dependent on various factors, such as training (Fisk and Schneider, 1981) and expectations (Posner et al., 1980). An important consideration when researching vigilance is to identify why vigilance fluctuates. The psychological tool used to investigate this is called signal detection theory (SDT). This measures two components of a person's ability to detect signals:

1. their perceptual sensitivity (referred to by d′)
2. the decision criterion (referred to by β) they use.

Consider the following situation. You are a radar operator looking for evidence of a missile attack by a foreign power. You are in a darkened room with a screen in front of you. The screen is alive with signals caused by commercial aircraft, flocks of birds and other aerial events. You are looking for a particular type of signal, which will probably never come. You have been trained to discriminate this signal from all others but the difference is not that great and a mistake is easily made. If you see the signal for a missile attack, you have to press a red button. This will automatically alert the local airbase and scramble attack aircraft, closely followed by the firing of retaliatory missiles. Your decision to press the red button will clearly be determined by your perceptual sensitivity to the difference between missiles and a flock of birds (d′). However, it will also be determined by your decision criterion.

AIR TRAFFIC CONTROL
ROBERT THOMPSON.

"Yippee! Join the dots!"

If you press the button and you're wrong (it *is* a flock of birds), you may start the Third World War. This is called a *false alarm*. To avoid this, you need to adopt a conservative criterion and only press the button when absolutely certain. Contrariwise, if you don't press the button when missiles *are* coming then your failure to respond could lead to the annihilation of your country. This is called a *miss*. To avoid this you need to adopt an aggressive criterion and press the button at the first sign of enemy action.

The point is that the response to the same signal and with the same perceptual sensitivity depends on a decision criterion (β), which can vary from conservative to aggressive. Investigations of vigilance need to take these two factors into account.

Wickens (2002) found that training observers, showing them samples of what they were looking for and varying the event rate, all improved perceptual sensitivity (d′). Providing good instructions which told the observer of the consequences of different actions, giving feedback on performance and giving false signals, all shifted the observer's criterion.

Self-test: What factors, according to signal detection theory, affect detecting a signal or stimulus?

Focused/selective attention

Focused auditory attention

The central question in investigations of focused auditory attention is the degree to which we can focus on an attended message while excluding other, undesired messages. To what extent can we select what we attend to? This section reviews several models of focused auditory attention in an attempt to answer this question (see Activity box 13.2).

Cherry (1953) first identified the 'cocktail party phenomenon', a reference to the ability to listen selectively to one conversation during a party while ignoring the noise going on around you. Cherry used a dichotic listening task to investigate this (see Research methods box 13.1). In this sort of experiment different messages are presented to each of a participant's ears and he or she is asked to shadow or repeat one of the messages. This ensures that he or she is attending to the shadowed message.

ACTIVITY BOX 13.2

Dichotic listening task

[This activity needs three people.]

This activity needs one person to be the 'attender', one to present the shadowed input and one to present the unattended message. Find a piece of relatively simple text that can be shadowed. Write down a list of simple words and randomly mark half of them (without the attender seeing them).

The presenter of the shadowed input sits on one side of the attender and reads the text at an even pace. The attender is told to shadow the text as closely as possible and ignore the unattended message. The presenter of the unattended list sits on the other side of the attender and reads the marked words at an even pace. The text and unattended list should begin and end at the same time. At the end of the shadowing present the attender with the full unattended list and ask him/her to mark those words that were presented.

Ask the attender to discuss his/her experience with the other two team members. Was the unattended message being ignored? Was this reflected in the attender's performance on the wordlist?

With a little practice subjects are able to do this quite efficiently. Researchers have asked what happens to the unattended message. Cherry (1953) found that participants could report only the physical characteristics of the message, such as whether it was a man's or woman's voice. They were not able to say whether the message was in English or a foreign language, indicating that non-physical characteristics such as the language (or meaning) had not been processed.

Self-test: What is meant by the 'cocktail party phenomenon'?

Broadbent's filter model of selective attention

Broadbent (1958) proposed a filter model to explain Cherry's findings. He argued that, to prevent us from becoming overwhelmed by sensory input, there is an attentional filter that prevents all but the desired, selected message from getting through to perceptual processing.

RESEARCH METHODS BOX 13.1

Dichotic listening task (Cherry, 1953)

The purpose of the dichotic listening task is measure the participant's ability to attend to two simultaneous messages while ensuring that she or he is attending to one. The participant is fitted with a set of headphones. These are set up so that one message can be delivered to one ear and another message to the other. The situation is designed to simulate hearing two messages coming from different locations in space.

The participant has to repeat one of the messages as it is delivered. This is called shadowing and the message being shadowed is called the attended message. The other message is the unattended message. The participant is told that whatever else she or he is asked to do they must make shadowing a priority. This ensures that the attended message is being given full attention. The experimenter can then look at what is happening to the message in the unattended ear.

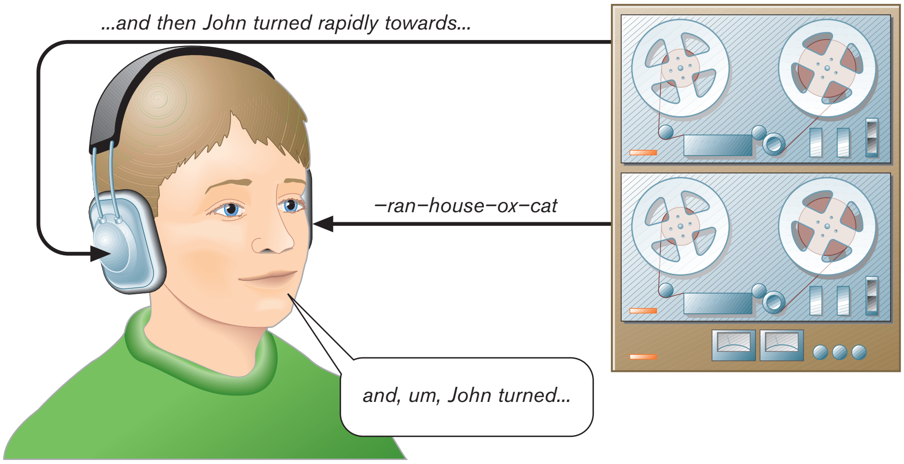
...and then John turned rapidly towards...
–ran–house–ox–cat
and, um, John turned...

Figure 13.1 The dichotic listening task: the participant receives different messages in each ear and has to repeat, or shadow, one of them while ignoring the other
Source: Anderson, 1995: 76

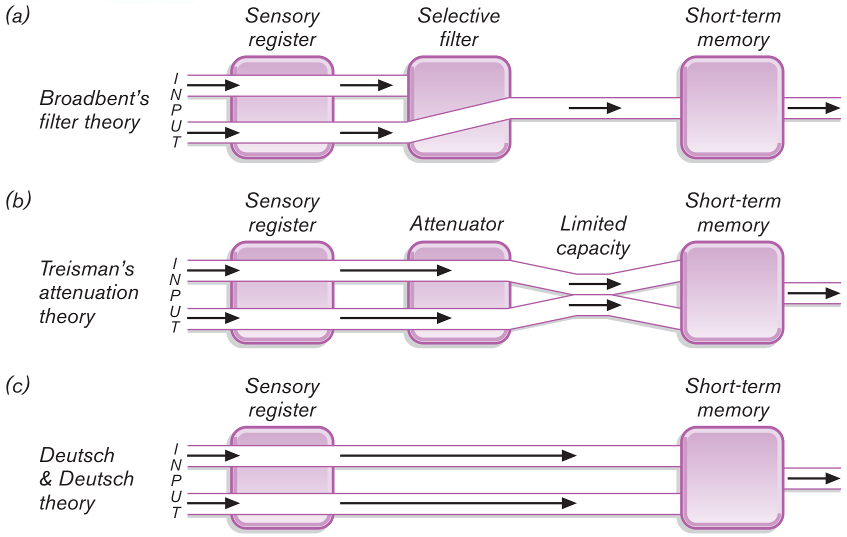

Figure 13.2 (a) Broadbent's filter model of selective attention: incoming information is filtered very soon after entering the perceptual system. Only one input is allowed through for further processing after this 'bottleneck'. The others are shut out; (b) Treisman's attenuator model of selective attention: incoming information is attenuated very soon after entering the perceptual system. All inputs but one are attenuated (or 'softened') so that they can all pass through the (limited capacity) 'bottleneck'; (c) Deutsch and Deutsch's late selection model of attention: all incoming information is fully processed. There is no early 'bottleneck'. One input is given precedence nearer the time when a response has to be made.
Source: Eysenck and Keane, 2000: 123

This filter, he argued, is located right after the incoming information is registered at the sensory level. Crucially, it operates on the basis of physical characteristics of the message. So, in a crowded room, it lets through the voice of the person you're speaking to but everything else is heard only as noises and voices (see Figure 13.2).

It soon became clear that the model was wrong. Moray (1959) found that subjects could recognise their own names in the unattended ear, a common phenomenon in a noisy room. This indicated that the unattended message was being processed for meaning. It wasn't being shut out immediately after sensory analysis. Treisman (1964) found that subjects noticed if the unattended message was the same as the shadowed message when they were presented with a lag between them. This happened regardless of whether the shadowed message led or lagged behind the unattended message. She also found that bilingual participants were able to recognise the identity of the two messages when the message was the same in the person's two languages. These findings also indicated that the unattended message must be undergoing processing for meaning. This was not consistent with Broadbent's filter model.

Treisman's attenuator model of selective attention

Treisman (1964) proposed her own attenuation model (Treisman's attenuation model) of selective attention. She argued that all messages were processed beyond the sensory stage but that the unattended messages were subject to attenuation. Broadbent's filter is replaced by an attenuator that 'softens' the unattended message. This is necessary because the system has limited capacity and can handle only a limited amount of information. This limited capacity takes the form of a bottleneck after the attenuator. She also surmised that stimuli such as one's own name have low thresholds for activating meaning because of their importance, and so have an impact even in attenuated form (Treisman, 1964). A central problem with this model is the lack of clarity about what is meant by attenuation. Why should an attenuated message take less processing capacity than a non-attenuated message? What is different about it? How is it less demanding? The term 'softening' is really only a metaphor? These questions have never really been answered by the theory.

Self-test: What is the difference between the Broadbent and the Treisman models of selective auditory attention?

Deutsch and Deutsch response selection model

The common feature of these two theories is that they propose a bottleneck that limits what gets through to be processed. Both bottlenecks occur early and so both are known as early selection models. They differ in how they function: filter (shut out) versus attenuator (soften). In contrast, late selection models, proposed by Deutsch and Deutsch (1963) and Norman (1968), argued that all inputs are processed perceptually and for meaning but with no attenuation. This is why participants recognised their own names and the identity of the two messages. They also argue for a bottleneck because of limited capacity but the bottleneck comes at the response stage, when only one of the messages can be responded to.

A number of experiments tried to distinguish between the Treisman (1964) and the Deutsch and Deutsch (1963) models by asking participants to shadow one ear and to signal every time they heard a target word. The target word could occur in either ear. Target detection was never as good in the unattended ear (8% detected) as in the shadowed ear (87% detected), supporting Treisman's notion of attenuation (Treisman and Geffen, 1967).

However, shadowing is a very demanding task and it is perfectly possible that the unattended message is being fully processed but that trying to organise a response to the unattended message while shadowing is so difficult that the unattended target is lost from memory before the response can be made. Support for the late selection view comes from the fact that the unattended target *is* reported, even if only infrequently and from findings which indicate a non-conscious response to the meaning of the unattended message. Thus Von Wright et al. (1975) presented target words that had previously been associated with electric shocks. They detected a physiological reaction (a galvanic skin response, denoting anxiety) to targets in *both* ears, Words semantically related to these shocked targets also produced a physiological response, supporting the idea that the unattended targets were being processed for meaning i.e. fully processed. Leaving to one side the ethics of such an experiment, the results suggest that the unattended message is getting through non-consciously, even if it is not always reported.

Perhaps the resolution to the question of early or late selection is the argument that selection is under strategic control. The listener decides whether to exclude a message and where to exclude it (early or late). Johnston and Wilson (1980) showed that the fate of the unattended message depended on the task. When the listener focused on one ear and expected targets only in that ear, the unattended message was largely ignored. However, if they were told that targets could occur in either ear then the unattended target did have an effect. More recently, Lavie (1995) has argued that if the attended message is very demanding then early selection occurs but if it imposes only a light load then late selection is possible. While there is evidence for this from selective visual attention, evidence from auditory attention is lacking.

Self-test: What is meant by ‘early’ and ‘late’ selection of inputs in auditory attention?

Focused visual attention

Covert attention and sensory memory

We are all familiar with focusing our attention by swivelling our eyes and fixing on a target, but research shows that we also select and focus attention internally – in conditions where there isn’t time for eye movements. Posner (1980) calls this covert attention to distinguish it from the overt attention associated with eye and head movements.

Research on visual sensory memory, also called iconic memory, provides evidence that selection of specific targets for focused attention occurs early in the perceptual process, before stimuli have been analysed for meaning. (See Chapter 14, which deals with memory, for further details of iconic memory.)

Recall that in Sperling’s (1960) experiment participants were able to direct their attention to different parts of the visual array – the top, the middle and the bottom – as directed by a high middle or low tone. Remember also that this was in conditions where eye movements were not possible because the arrays appeared for only a very short time. This means that participants were able to direct covert attention to different locations in the array *internally*. Later experiments showed that they were actually able to direct their attention to very specific locations in the array, indicated by a bar and report the letter in this location (Averbach and Coriell, 1961). These results indicate that covert visual attention can be directed to specific locations very early in perceptual processing.

Shifting covert attention – the spotlight analogy

An experiment by Posner et al. (1978) showed more explicitly that we can shift the focus of covert attention. A useful analogy to aid understanding of this is the spotlight analogy – that of attention being like an internal spotlight that can be turned on to the target stimulus: anything in the spotlight is given full attention; anything outside the spotlight is given less or no attention (see Figure 13.3).

Posner (1978) had participants respond to a stimulus that could occur to the left or right of a fixation point. On the majority of trials (condition 1) they were correctly cued as to which side the stimulus would appear. On some trials (condition 2) they were misled as to where the stimulus would appear. In a third, control, condition there was no cueing as to where the stimulus would appear (see Figure 13.4).

The results were clear (see Figure 13.5). Responses were quickest in condition 1, suggesting that participants made use of the cue to shift attention to where they expected the stimulus to come and where it subsequently came. Condition 2 was the slowest because the cue was

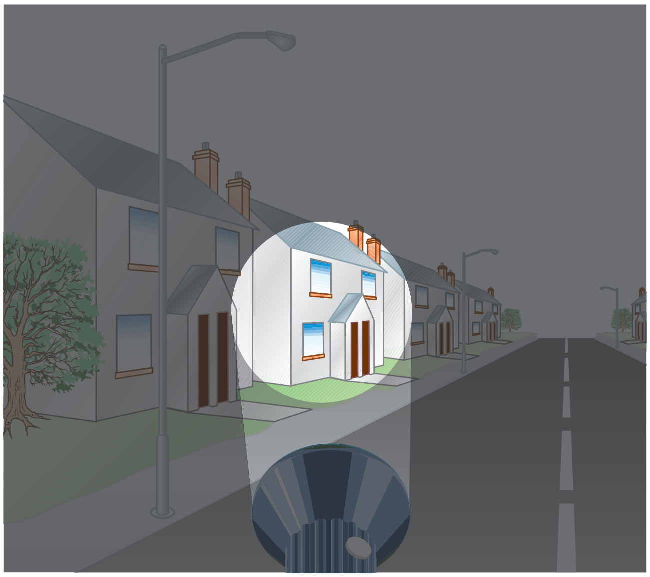

Figure 13.3 The spotlight analogy of visual attention: covert or internal attention has been compared to a spotlight, with one part of the stimulus being ‘illuminated’

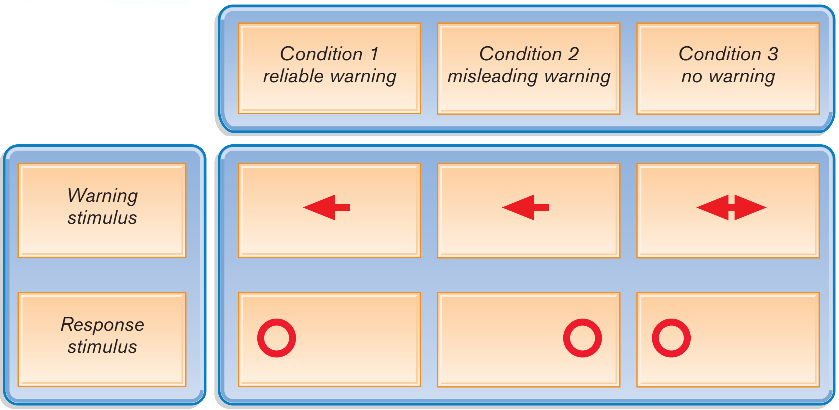

Figure 13.4 Schematic representation of Posner, Nissen and Ogden's (1978) experiment on shifting visual attention. In condition 1 the participant is warned that the stimulus will appear on the left of the fixation point. The participant shifts attention to the appropriate location and this is where the stimulus appears. In condition 2 the participant is given the same warning but the stimulus actually appears on the other side. The participant has to shift attention from the wrong location to the right one. In condition 3 the warning is neither a help nor a hindrance

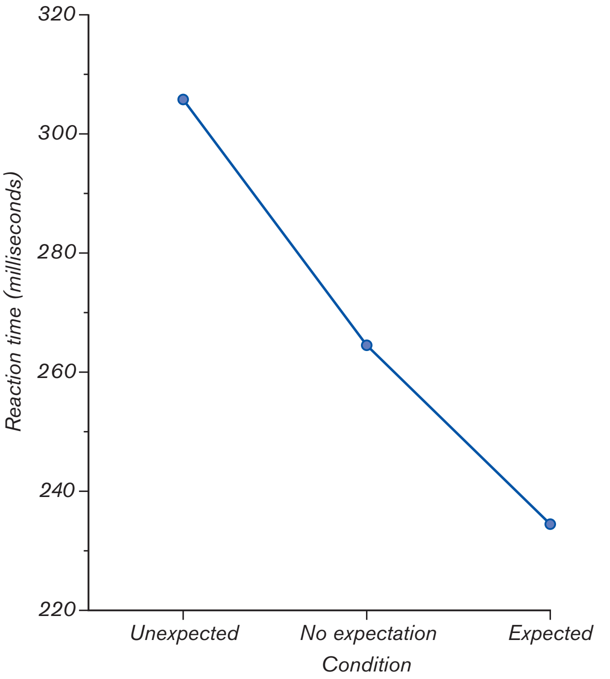

Figure 13.5 Time taken to focus attention on a target: the time taken to respond to the stimulus depends on the extent to which attention has to be shifted
Source: Posner, Nissen and Ogden, 1978

misleading. They shifted attention to where they expected the stimulus to come but then had to change direction because the stimulus came to the other side. The control results were midway. This experiment showed the ability to shift attention internally as circumstances demand.

Self-test: What aspect of visual attention does the spotlight analogy capture?

Components of covert attention

Posner and Peterson (1990) distinguished three stages in the shifting of covert attention: disengagement from the stimulus being attended to, shifting of attention to the new stimulus and engaging with the new stimulus. They argue that attentional problems as a result of brain damage can be linked with impairments to one or other of the three stages. The clearest evidence in support of this comes from patients suffering from unilateral neglect and the experiment by Posner et al. 1982 (see Applications box 13.1). The neuropsychological evidence for the other stages is less clear. Posner et al. (1985) studied patients who had problems shifting covert attention in the vertical plane but not in the left-right plane. Given that they can do one but not the other the problem must be due to shifting attention and not disengaging. The evidence for a difficulty in engaging attention comes from patients who cannot focus attention on objects presented to the damaged hemisphere of the brain (Rafal and Posner, 1987).

Covert attention and the zoom lens analogy

What happens to a visual stimulus not in the spotlight? Is it completely shut out, as in Broadbent's auditory model? Is it attenuated, as in Treisman's auditory model? Or is it fully processed, as in Deutsch and Deutsch's auditory model? The evidence suggests that whatever happens is under strategic control. LaBerge (1983) found that if attention was focused on the central letter of a five-letter word, then much less attention was paid to the letters on the left and right of the central letter than to the central letter (see Figure 13.8).

However, if participants were instructed to attend to the whole word, then as much attention was paid to the peripheral letters as to the central one. This experiment suggests that the way attention is spread over the visual field is under strategic control. The degree to which it can be focused can be varied depending on instructions and the demands of the situation. Perhaps the spotlight model should be rebranded as the zoom lens model. If the 'lens' is on telephoto then a restricted part is in close focus. If the 'lens' is on wide angle, taking in a larger area, then there is less attention to go round and the overall clarity suffers.

Self-test: What aspect of visual attention does the zoom lens analogy capture?

Divided attention

This section deals with divided attention, which is in many ways the opposite of focused attention (see Activity box 13.3). Where research into focused attention asks about the extent to which we can focus on one task and ignore others, divided attention asks about the extent to which we can do more than one task at the same time. This research is best understood in the context of theories of limited attentional capacity.

Kahneman's capacity model of attention

Kahneman's (1973) model argues that attention is a limited resource but that it is, to some extent under strategic control. Motivation and effort can affect the amount of available capacity, but only to an upper limit. Attentional capacity can similarly be increased to meet the demands of a difficult task or decreased to deal with an easier task, but the ability to perform two tasks simultaneously therefore depends on the demands the two tasks make on this central capacity. If both tasks can be carried out without exceeding the capacity then they will be performed together as well as they will be performed separately. If the demands of the task exceed capacity then one or both tasks will suffer.

Self-test: What are the main characteristics of Kahneman's central capacity model of attentional resources?

Allocating attention to competing tasks

An experiment by Wickens and Gopher (1977) supported Kahneman's view that resource allocation is under strategic control (see Activity box 13.4). Participants were given two tasks. One was a tracking task, which involved keeping a pointer on a moving reference point (called a *pursuit rotor* – sometimes seen at fair grounds). The second was a task

APPLICATIONS BOX 13.1

Unilateral visual neglect

Our understanding of a fascinating neuropsychological disorder called unilateral visual neglect has been significantly advanced by our understanding of some of the processes involved in the normal shifting of atttention. This is another example (see visual object agnosia in Chapter 12) of how theory and (clinical) practice) each stimulate understanding of the other.

Unilateral visual neglect is a condition that arises out of extensive damage to one of the hemispheres of the brain in the parietal lobe region. Patients with neglect ignore one half of visual space, on the opposite (contralateral) side to the damaged hemisphere. Unilateral left neglect, due to damage of the right hemisphere, is the more common.

This neglect may take several forms. For example, the patient may eat food from only the right side of a plate. The left half of the body will not be dressed and the left half of the face not shaved. In unilateral left visual neglect, the person behaves as if they have no visual input from the left half of space. This is reflected in their drawing and in simple tests like line cancellation when, if asked to cancel through a display of lines, they will omit only the lines on one half of the page (see Figure 13.6).

The condition is not due to a perceptual deficit. There is nothing wrong with vision. This can be shown by the fact that the degree of neglect varies with the importance of the stimulus in the neglected field. For example, Marshall and Halligan (1988) showed left neglect patients pictures of two houses. They were identical except that in one house flames and smoke were pouring out of a left-hand window. The patients reported no difference between the two pictures, presumably because the left half of each house was being ignored. However, when they were asked which house they would like to live in they picked the one without the smoke!

Neglect is also found when these patients are asked to draw something from memory. Bisiach and Luzzatti (1978) asked two patients with left neglect to describe the Piazza del Duomo in Milan from memory and from two perspectives: one looking towards the cathedral and the other away from it. In both cases, the patients only described landmarks that were on the right!

Posner et al. (1984) have argued that neglect is an impairment of covert attention. They distinguished three aspects of shifts of covert attention: disengagement of attention from its current focus, moving attention to the new focus and engagement of the new focus. In left visual neglect, the patient finds it difficult to disengage his/her attention from the 'good side' (from objects on the right-hand side of space) and move it to the 'damaged side' (to the left-hand side of space). This is why the 'damaged side' is neglected. Posner et al. (1982) showed this using the cueing experiment reported earlier.

We can see from Figure 13.7 that when the person is cued to expect something in the neglected field it doesn't matter too much whether the stimulus comes there or not (the damaged side is not engaging the stimulus). However, when the person is cued to expect something in the normal field but the stimulus appears in the neglected field it makes a massive difference. This is because the 'good side' has captured the stimulus and won't let go.

APPLICATIONS BOX 13.1 (CONTINUED)

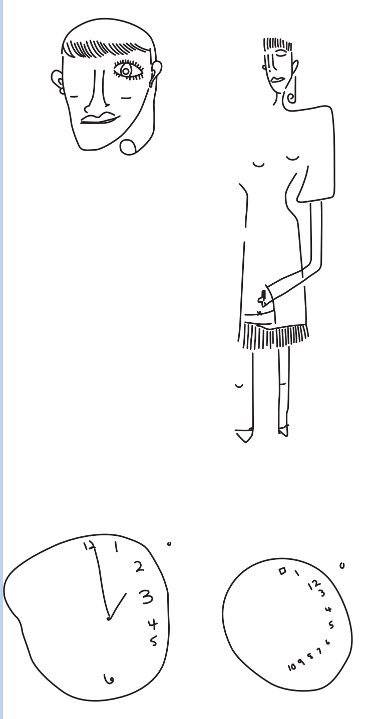

Figure 13.6 Patients with unilateral left visual neglect. Notice that details in the left half of the drawings have been omitted or neglected.

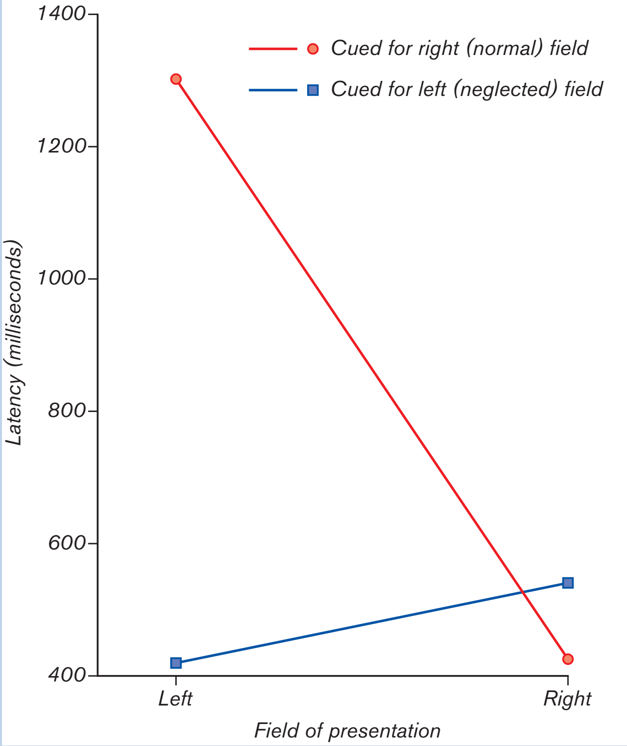

Figure 13.7 Responses to valid and invalid cues by a patient with right hemisphere damage
Source: Posner, Cohen and Rafal, 1982

requiring the participant to respond as quickly as possible every time a number came up on a screen.

The participants had to do both tasks at the same time. However, they were given different instructions in different conditions as to the priority each task was to be given. In one condition, 100% priority was to be given to the tracking task and 0% priority to the digit monitoring task. In another condition, the split was 70% priority to the tracking and 30% to the monitoring. In a third condition, the split was 30% and 70%. In the final condition, the split was 0% and 100%. Thus they prioritised according to instruction. The results were clear. As the priorities shifted from one task to the other the relative performance changed (see Figure 13.9).

Attentional demands, practice and automaticity

We all know that 'practice makes perfect'. An interesting question concerns the degree to which practice allows two tasks, which initially put a substantial load on attentional capacity, to be done simultaneously as well as each could be done alone. This was answered in an experiment by Spelke et al. (1976) with two participants, Dianne and John. These two (paid) volunteers were required to do two tasks simultaneously: read for comprehension and write to dictation. Initially, of course, they found doing this very difficult and made many errors. They then received 5 hours' training a week. After 6 weeks of practice they were able to read while writing as well as they could read on its own. There were mistakes, but in general the performance was impressive.

However, an analysis of the results also showed that Diane and John weren't processing the dictated words to any depth because, for example, they weren't aware that some of the words in sequence formed a sentence. With yet more practice they were able to categorise each dictated word (e.g. table – furniture), showing that processing of these words could now be done to a semantic level. This experiment provides impressive evidence of the effects of practice on divided attention. It seems to reduce the amount of attention needed to perform one or both tasks.

Other evidence of the fact that highly practised tasks can demand little or no attention comes from Allport et al. (1972), who showed that expert pianists (who practise their skill many hours a day) could play from seen music,

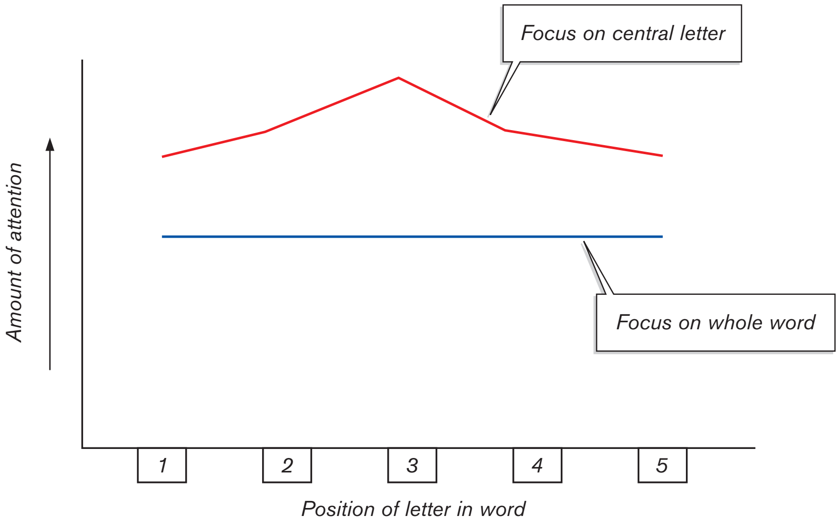

Figure 13.8 Idealised representation of the amount of attention paid to peripheral letters as a function of the degree of focus
Source: based on Laberge, 1983

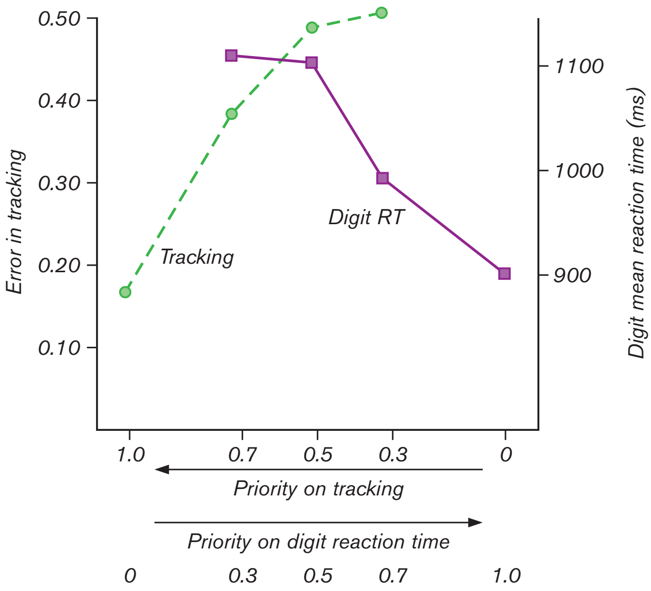

Figure 13.9 Changing priorities in dual task performance
Source: Wickens and Gopher, 1977

without detriment, while shadowing. Other evidence of the effect of practice on attention comes from our own experience of driving. We all remember that, when we first learn to drive, conversation, listening to the radio or doing anything while driving is virtually impossible because driving takes all our attention. However, with experience and practice driving becomes 'automatic' and we seem to have lots of attention left over for these other things.

The theoretical question raised by practice is whether practice causes one or both tasks to become automatic. (We cover this issue in Chapter 16, on expertise.)

Recall Anderson's theory, which identified the three stages of skill acquisition:

1. a cognitive stage, in which knowledge is declarative and hence in conscious awareness
2. a procedural stage, in which this knowledge is implemented as a set of production rules
3. an automatic stage, in which the task no longer requires attention, does not require conscious awareness and is difficult to interrupt.

The participants in these studies of the effects of practice seem to be well on their way to this final stage. The practised tasks do seem to need very little attention. However, it is less clear whether they need conscious awareness or whether, once started, they would be difficult to interrupt. A good example of automatic processes that fulfil these criteria comes from the Stroop effect (see Chapter 16) which shows that single word reading is a completely automatic process. Participants who are asked to name the ink colour of a word find it much harder when the word is a colour name than when it is a neutral word (e.g. blue as opposed to clue). The meaning of the word differentially disrupts naming the colour in which it is written. This is because the brain's processing of the meaning of the word is automatic in experienced readers. It takes little attention, is not under conscious control and cannot be stopped (participants can't resist the Stroop effect). It's doubtful whether reading continuous text for meaning could ever reach this state of automaticity. (See Applications box 13.2.)

Self-test: Why can practice have such a dramatic effect on our ability to do two things at the same time?

Single versus multiple resources

The ability to do two things at the same time is also dependent on the similarity of the two tasks involved. The evidence supporting this forces us to reconsider the idea that there is a *single* bank of resources that are allocated to

CLASS ACTIVITY BOX 13.1

Attention

These exercises are designed for group work in seminars. They rely on the tutor being available to help and to discuss the purpose of the exercise and its implications.

The aim of this activity is to help you develop an understanding of divided attention and your expertise in simple experimental design. Work in groups and restrict your design to *one* independent variable. Keep the number of levels to two or three. Be aware that you may need a control group. You may consult your lectures notes or any other information you have to hand.

1 Divided attention. You are a researcher, commissioned by the Division of Road Traffic Accidents to investigate the relative effects on driving of (1) in-car hands-free mobile phone, (2) another passenger, (3) car radio. You have full use of a driving simulator which can give you information you might need about steering steadiness, hazard detection or braking time:
   1 Outline an appropriate experiment.
   2 Name the independent variable.
   3 Identify the levels of the independent variable.
   4 Identify your dependent variable and how it will be measured.
   5 State briefly what you would expect to find and why.
   6 Draw a graph of the expected results for the dependent variable you have chosen.

The aim of this second activity is to encourage you to apply your psychological knowledge about the factors that affect divided attention to a practical situation. The example is for tennis but you could apply the same principles to other sports.

2 Automaticity. You are a tennis coach being paid a lot of money to improve a client's game. You hold the view that some processes in playing tennis well can become automatic, requiring little attention, while others require cognitive effort and attention. Sketch out a simple strategy to improve your client's game. Justify your answer.

answers at the end of the section

tasks as priorities demand. The effect of similarity can be seen clearly in an experiment by Segal and Fusella (1970). They had participants do different combinations of two tasks simultaneously (see Table 13.1).

Participants in condition A (constructing an auditory image and detecting an auditory stimulus) are doing two similar tasks in the sense that they both involve audition. Participants in condition B are doing two less similar tasks in that one involves audition and the other vision. If similarity of task is important, then condition A should produce worse performance than condition B. By the same logic, condition D should be harder than condition C. So the two similar conditions (A and D) should be harder than the two different conditions (B and C). What they found is illustrated in Figure 13.10.

The ability to detect an auditory or visual stimulus while forming auditory or visual images depended on the combination of tasks. As predicted, two different tasks produced better detection than doing two similar tasks.

Experiments such as these have great theoretical importance. The fact that performance depends so crucially on the similarity of the tasks casts doubt on a single resource theory, such as Kahneman's, which says that there is one central 'bank' of resources that are allocated to the two tasks. If this were true, then performance shouldn't be affected by particular combinations of conditions (see Figure 13.11a).

Notice that the results of the Segal and Fusella experiment can't be ascribed to task difficulty. Suppose constructing an auditory image was a very difficult task and it was this that produced poor performance in condition A. This would mean that performance in condition C should also be very poor. But condition C produces relatively good performance. The same argument can be used against the suggestion that any one of the four tasks is particularly difficult.

In contrast, the results can be explained if we abandon the idea of a *single* all-purpose 'bank' and consider that there might be *separate* 'banks', one for visual processing and one for auditory processing, each with its own attentional resources. This is multiple resource theory (Navon and Gopher, 1979; Wickens, 1992) and it says that the degree to which two tasks interfere with each other depends on whether or not they use the same processes (e.g. visual or auditory) (see Figure 13.11b).

Central resource theory argues that simultaneous tasks are handled by a central bank of resources. It doesn't matter whether these tasks are similar or different. Think of an open-plan office with a central pool of workers who are qualified to handle any type of task.

Multiple-resource theory argues that simultaneous tasks are handled by separate banks of resources. It does matter whether the tasks are similar or different. Think of a divided office where the workers in each part are qualified to handle only 'their' type of task.

APPLICATIONS BOX 13.2

Practice, automaticity and sporting performance

One key factor in sporting success is practice. David Beckham is well known for practising free kicks long after his teammates have left the training field. Tiger Woods is similarly known for his relentless practising of swinging and putting. Donald Bradman, the great Australian batsman who averaged 99.9 runs for test matches, reputedly practised hitting a tennis ball against a wall with a cricket stump for hours on end and Gary Player, a great golfer from the 1960s, once remarked in response to accusations that he was lucky that the more he practised the luckier he got. The players in the England football team are castigated for not practising penalties.

So, why the emphasis on practice? The attentional research we have covered (see also the coverage of skills in Chapter 16) suggests that practice make actions and sequences of actions automatic. Automatic actions require minimal intention and minimal attention and are performed largely at a non-consciously level. This seems to have two effects. First, the automatised action (or sequence of actions) become more resistant to the effects of day-to-day variations in performance (tiredness, off-day, anxiety, etc.) Once initiated, the sequence is completed without having to think. Indeed, thinking about an automated sequence like a golf swing or taking a penalty can lead to 'choking', with disastrous consequences. Second, for complex sporting activities such as football, once ball control has become automatic, attentional capacity is liberated and players are able to devote more attention to the tactical aspects of the game. Recently, an opponent of the Arsenal football team expressed admiration at how a passing sequence seemed to have been planned three and four moves ahead. This would surely not be possible if the players were having to devote significant attentional capacity to passing the ball accurately while moving at high speed. Their highly practised technical skills gave them free cognitive capacity to think ahead.

TABLE 13.1 THE COMBINATION OF TASKS IN SEGAL AND FUSELLA (1970)

	Construct an auditory image	Construct a visual image
Detect an auditory stimulus	Condition A	Condition B
Detect a visual stimulus	Condition C	Condition D

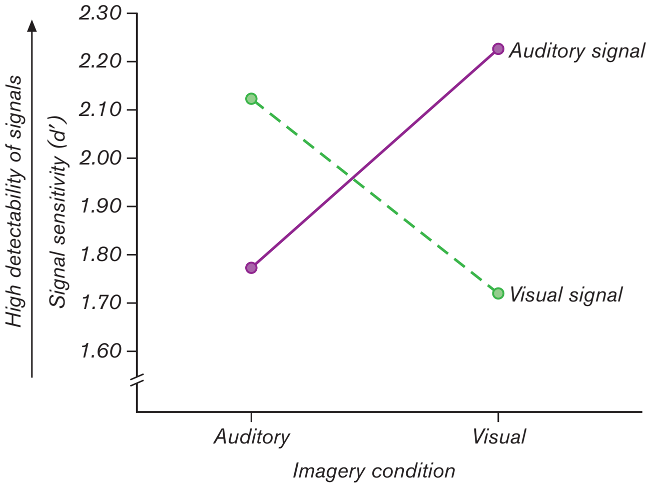

Figure 13.10 Graph of performance in Segal and Fusella (1970)
Source: Eysenck and Keane, 2000: 140

Some models, such as Baddeley and Hitch's (1974) working memory model (see Chapter 14), have compromised between one central all-purpose bank of resources and multiple-resource, modality-specific banks of resources. In their model there is a 'central executive', which is a central all-purpose resource, and two modality-specific resources called the phonological loop and the visual-spatial scratchpad. (See Applications box 13.3 for a review of human error and approaches to it.)

Self-test: What evidence indicates that we must accept a multiple resource view of attentional resources?

Summary

In this chapter, we have looked at various aspects of attention. We began with vigilance, the aspect of attention that deals with detecting events. Then we looked at focused auditory attention and compared several models of how we select one message and (relatively) ignore others. In our

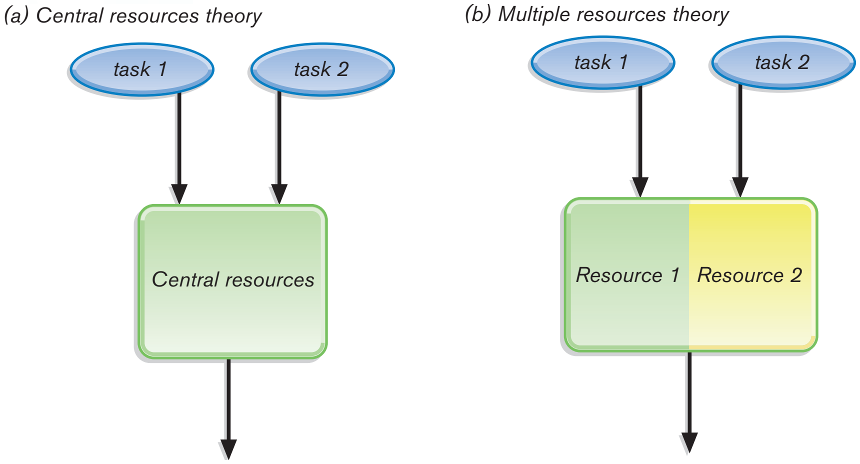

Figure 13.11 A schematic representation of (a) central and (b) multiple resource theories

APPLICATIONS BOX 13.3

Human error

We all make errors. Fortunately, most of our errors do not have serious consequences, although they may cause us considerable embarrassment. In some professions, however, the consequences of error can be very serious. Reports of surgeons removing the wrong leg, soldiers firing on their comrades and nuclear reactors melting down are relatively infrequent but are still very disturbing examples of human error.

It is important to understand why errors occur because then we might be able to do something about them. Reason (1990) argues that we can adopt two approaches. The person approach places great emphasis on personal responsibility and generally ascribes errors to forgetfulness, inattention, poor motivation and negligence. Generally it has little to say about how errors can be reduced, except by appealing to people's vigilance and sense of responsibility.

The systems approach takes the view that we all make mistakes but that these errors often have their origins in faulty systems or practices. Thus, Reason refers to the errors we make as active failures and to the circumstances that breed them as latent conditions. The systems approach argues that errors can be reduced by actively looking for accident-inducing conditions. For example, if a factory has a high accident rate then we should look at the safety procedures, the shift patterns, training regimes and so on, for evidence that aspects of the system are inducing accidents.

The systems approach does not mean that we ignore the personal variable. Psychologically, we are looking for the factors (independent variables) that induce human error (dependent variable). We can then try to eliminate the effects of these factors.

Reason (1990) has identified three kinds of cognitive process that underlie errors. First, there are skilled processes. These are automatic in nature and are carried out without much conscious awareness. They are highly practised routines. Everyday examples are brushing your teeth and making a cup of tea. Errors, called slips, occur when you fail to disengage one of these routines. Making a cup of tea when you actually wanted a cup of coffee or a doctor telling someone in the early stages of meningitis to lie down and take a paracetamol for their headache are examples of an automatised routine being wrongly engaged.

Second, there are rule-based processes. These involve following a set of procedures (for example, what you do when the fire alarm rings). Errors occur when these procedures are violated. Readers will recall the recent case in which John Charles de Menezes was shot dead by armed police in a tube train in Stockwell, London, in mistake for a terrorist. The jury that heard the case concluded that the tragedy occurred because of multiple failures in the procedures for apprehending a terrorist suspect. They absolved the individuals involved of blame.

Finally, there are knowledge-based processes. These involve thinking through a problem and arriving at a solution. Errors may occur when a new product is being designed. Examples are the relatively frequent recall of domestic products, especially cars, because they have a design fault that makes them dangerous to use.

Reason argues for adopting a systems approach. Although blaming individuals is emotionally more satisfying than targeting institutions, much the best results in accident reduction are obtained by institutions such as the military and air traffic controllers that actively look for the errors that could occur and then actively look for ways to reduce their likelihood.

coverage of focused visual attention, we examined the spotlight model and then at how constructing a percept in the spotlight takes attention. In the final section we looked at the ability to divide attention between two tasks simultaneously, and examined different models of how this is done.

Self-test:

- What is visual neglect? How can it be explained?
- According to Reason, what kinds of process underlie human error?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the basic concepts in signal detection theory.
2. Compare three models of focused auditory attention.
3. Outline the characteristics of focused visual attention, contrasting the spotlight and zoom lens analogies.
4. Identify and discuss the factors that determine the degree to which we can do two tasks at the same time.
5. Distinguish between controlled and automatic processes.
6. Outline the differences between central and multiple resource models of attention.

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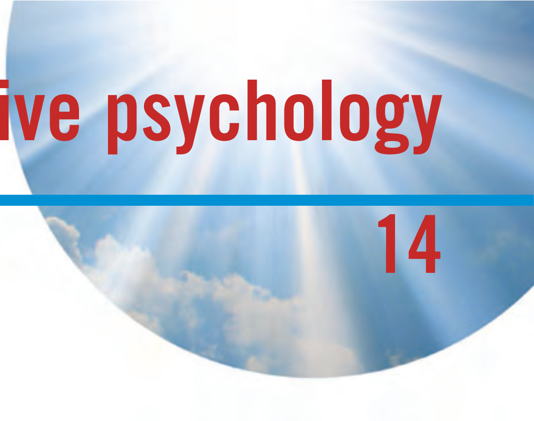

14

Memory

Route map

The aim of this chapter is to introduce some of the key aspects of memory. It begins with an overview of the different memory systems. It then describes three types of memory: visual sensory memory, short-term memory and long-term memory. We then move on to discuss three memory models that seek to explain some of these results and the next section describes the major memory processes of encoding, retrieval and forgetting. The final two sections describe autobiographical and semantic memory.

Introduction

What is memory? What role does it play in our lives? How important is it? One way to answer these questions is by imagining what it would be like if you lost your memory completely. You wouldn't be able to recognise anything you'd ever seen, heard, tasted, smelt or touched. Suppose you also lost the ability to form new memories of any kind so that everything you experienced or learnt simply 'passed through you'. Nothing would be retained for more than a matter of seconds. You wouldn't even be able to start restoring some of what you'd lost. The world in which you now lived would be completely alien, with no hope of ever becoming familiar.

The importance of memory is best appreciated by looking at people who have lost theirs through brain damage – a condition called amnesia. A good example of an amnesic is Clive Wearing, who is the subject of many journal articles, including one by his wife Deborah (Wilson and Wearing, 1995). Clive was a very talented musician who was struck down at the peak of his career with a disease called *herpes simplex encephalitis*, a virus that attacked his brain and left him with devastating memory loss. He has anterograde amnesia, which means he is completely unable to acquire new memories. Anything that happens is lost within minutes. If his wife leaves the room and returns a few minutes later he greets her as if he hasn't seen her for months. He keeps a diary in which he writes 'have just woken up for the first time' every time he looks at it so there can be numerous such entries for the same day. It is as if he is living in a time capsule that extends back only a few minutes.

His memory for his past life is also devastated, a condition called retrograde amnesia. He has 'islands' of memory from life before his illness but, in general, cannot remember much from his childhood, from his university years or from his highly successful career. The only thing Clive has not lost is his musical skill. He can still play the piano and conduct his old choir with deftness and sensitivity.

Memory systems: an overview

Baddeley (1995) suggests we think of memory as an alliance of systems. Rather than there being a single entity that deals with all memories there are a number of related and connected systems, each of which deals with different kinds of memory. Memory has sometimes been likened to a library. Memories are categorised and stored according to type. The filing system ensures that most of the time they can be speedily recalled, but sometimes they cannot be retrieved. They are forgotten.

Memory systems for the senses

We can identify one cluster of memory systems that serve our different senses. There is a memory system for the visual modality that stores information about colours, shapes, objects, faces, works of abstract art etc. There is also an auditory memory system for stimuli such as tones, melodies and voices. Similarly, there are systems for odours, tastes and textures. The majority of our experiences in everyday life are multisensory and have multiple representations. Thus we remember someone not just by their face but also by the sound of their voice, the perfume they wear and even the 'feel' of their handshake.

Self-test: How many sense memory systems are there? What are they?

Memory systems based on duration of memories

One classification of memory systems is based on the length of time for which information is held. Sensory memories hold large amounts of ‘raw’ sensory information for a very short time, less than a second. Researchers have identified a visual sensory memory, called iconic memory, and an auditory sensory memory, called echoic memory. Second, there are short-term memory systems that hold small amounts of information, such as a telephone number, for short periods of time. Finally, there are long-term memory systems, which hold very large amounts of information for indefinite periods of time.

Self-test: How many memory systems based on duration are there? What are they?

Verbal memory systems

Humans, uniquely, have language and verbal memory is concerned with spoken material, such as conversations, and written material, such as text. It is also concerned with other language-based knowledge such as the meaning of words and the kind of facts we need to know for, say, a general knowledge quiz. Research into various aspects of verbal memory has made a major contribution to the development of theory and practice, which also applies to other memory domains such as visual and autobiographical memory.

Long-term memory systems

Episodic, semantic and procedural memory

Long-term memory actually refers to a number of different memory systems. Endel Tulving (1985) has been the architect of a theory that identifies these different types of memory. First, we have memories about episodes in our lives: going to the cinema last night, sitting a psychology exam last term, making a new friend last week and so on. Tulving calls this kind of memory episodic memory. The memories here are time-tagged multidimensional memories about people, objects, places and actions woven together. They are also accompanied by a clear awareness of remembering.

Second, and in contrast, we also have memories of a factual kind. This is evident from listening to any quiz show on television where the contestants can often recall a staggering number of obscure facts – or from your own knowledge of taking exams. In addition, we also have a huge store of conceptual knowledge such as what is meant by ‘furniture’, ‘animal’ or ‘truth’. These memories are not time tagged and are stored, according to Tulving, in semantic memory, a different system to episodic memory.

Finally, Tulving argues that there is a third kind of memory, called procedural memory, which is knowledge of how to do things. It is a system for knowledge of different kind of skills such as riding a bike, playing the piano, doing jigsaw puzzles and solving puzzles such as the *Tower of Hanoi* (also known as the Tower of London). An important characteristic of procedural memory is that it is not time tagged and is implicit in the sense that we have no feeling of remembering or even knowing that we are calling on memory. You know how to ride a bike, but you can’t necessarily explain how you do it.

Explicit and implicit memory processes

One of the distinctions between these systems lies in whether the processes that retrieve memories are explicit or implicit. Explicit processes are accompanied by conscious activity such as searching. If asked what we did last night we consciously search for the answer. Thus episodic memory is generally characterised by explicit processes. Implicit processes are not accompanied by awareness or conscious processes. The memory is reflected in the behaviour. So when you drive your car you’re not consciously remembering what you have to do – your knowledge is implicit and reflected in the fact that you’re doing the job reasonably well. Thus procedural memory is characterised by implicit processes. The processes in semantic memory, however, are not so clear. If asked for a fact (‘what is the capital of Australia?’) or a definition (‘what is a ball?’), you do have to search consciously, but when you use the term ball in conversation, you do so implicitly.

Self-test:

- How many long-term memory systems are there? What are they?
- What is the distinction between implicit and explicit processes of retrieval?

Neuropsychological evidence

One source of evidence for the distinction between these memory systems comes from neuropsychology. Thus amnesics such as Clive Wearing and HM have devastated episodic memories, with very little recall of their past lives. Conversely, they seem to have relatively unimpaired semantic memories in that they retain large vocabularies and conceptual knowledge about the world (e.g. Baddeley and Wilson, 1988). Most strikingly, all amnesics retain their procedural knowledge. Recall that Clive Wearing retained his many sophisticated musical skills.

Sensory memory, short-term memory (STM) and long-term memory (LTM)

Visual sensory memory (iconic memory)

Iconic memory was discovered by George Sperling as a PhD student at Harvard in the late 1950s. Sperling (1960) presented participants with an array containing 12 letters, as shown in the following box.

W	J	D	L
R	V	G	M
N	Q	F	S

This array was presented for a very short time (50 msecs). This is such a short time that there is no time for eye movements or checking on what has appeared. When participants were asked to report what they had seen, they were typically able to remember about four letters. This was the *whole report* condition. Sperling was convinced that all the letters were available but that most of them had faded by the time three or four had been reported. To show that all the letters were available for a brief time in sensory memory he devised the *partial report* condition.

In the partial report condition, the visual array was followed by one of three tones. Participants were told to report the top line if they heard a high tone; the middle line if they heard a middle tone and the bottom line if they heard a low tone. Because the tone occurred *after* the visual display had gone from the screen any letters they reported must have come from their memory of the display. Sperling called this memory store iconic memory. Participants were very successful at reporting letters from any of the three lines. This indicated that information about all the lines was present in iconic memory. To find out how quickly the information in iconic memory decayed, Sperling increased the interval between the presentation of the array and the onset of the tone. As this interval increased the number of letters reported fell off. At an interval of approximately one second about four letters were being reported. This is the same as in the whole report condition. Sperling concluded that the duration of iconic memory was actually about one-third of a second (see Figure 14.1).

An intriguing question concerned whether iconic memory occurred before or after the letters had been identified. An experiment by von Wright (1968) presented mixed arrays of letters and numbers and asked participants to report either the letters or the numbers. If iconic memory is operating after letters and numbers have been identified then the results should have been the same as when the instructions to report were based on location (tones or bars). They were not, indicating that iconic memory holds information at an early stage of processing, before they have been identified.

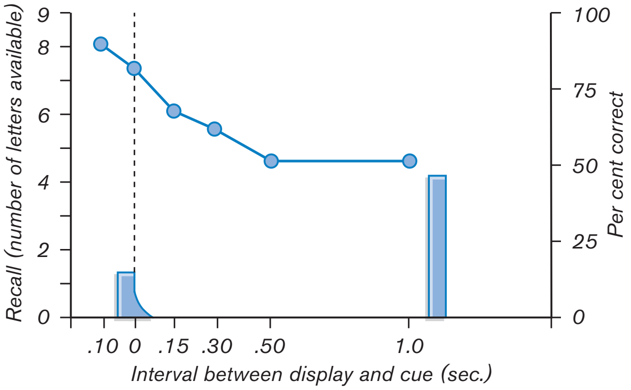

Figure 14.1 The decay of sensory memory: the number of letters reported decreases with time

Source: Solso, 1998: 87

ACTIVITY BOX 14.1

What is your letter span?

To get an approximate answer to this question, test your memory for each of the rows of letters below. For each row, read the letters out loud, about one per second. After the last letter, cover the line and write the letters down in the correct order. Continue with the remaining rows until you make a mistake. Your letter span is the number of letters in the last error-free row.

d t b j
r k c s t
l n r v z l
m p l x g v t
r t s d h k l b
m b c l j d s r f
k s r t n p v l s b
m r b k n d f z j p t

What is the purpose of iconic memory? Coltheart (1983) argues that it ensures that information is held in raw form for a minimum amount of time, allowing the processes of perception and attention to operate. (This issue is covered more fully in Chapter 13.)

Distinguishing short- and long-term memory

The distinction between short- and long-term memory was first made by William James (1890). He argued that primary memory (STM) holds whatever is in our consciousness, while secondary memory (LTM) contains the sum of our past experiences. In this section we report the evidence for the existence of separate systems for short- and long-term memory.

Capacity

The first major difference between short-term memory (STM) and long-term memory (LTM) is their respective capacities. The capacity of long-term memory is huge. Consider, for example, all the factual information you've acquired and can remember over many years of education. In contrast, the capacity of STM is very limited. George Miller (1956) showed that we could hold about seven items in short-term memory, plus or minus two (i.e. between five and nine). This can be demonstrated in a simple experiment on immediate memory span (see Activity box 14.1 and Research methods box 14.1).

Duration

A second difference between STM and LTM is the length of time for which material is held. Information can be held in LTM for a very long time and in many cases a lifetime. The term permastore has been used to refer to the durability of long-term memory (it is analogous to the term *permafrost*, which describes the permanently frozen ground of Arctic regions and in Russia). This isn't the case for all memories, but certainly for enough of them to be significant. Experimentally, the durability of long-term verbal memory was shown by Bahrick (1984), who found that people who had learnt Spanish some 50 years earlier remembered almost half the vocabulary they had acquired (see Figure 14.2).

In contrast, the durability of material in short-term memory is severely limited. This was shown by classic experiments in the 1950s and 1960s (Peterson and Peterson, 1959) using the Brown–Peterson technique. On each trial of the Brown–Peterson experiment the participant is given a single trigram (a three-letter syllable such as lef or kib), which has to be remembered for a length of time that varies from trial to trial. At the end of the specified time, the participant has to report the trigram. If rehearsal is allowed then performance is always around 100%. However, if rehearsal is prevented by, say, asking the subject to count backwards in threes (100, 97, 94, etc.) then the trigram is forgotten after about 15 seconds (see Figure 14.3).

RESEARCH METHODS BOX 14.1

Measuring the capacity of short-term memory

A common way of measuring the capacity of short-term memory is to measure a person's digit span. Digit span is one of the subtests of the Wechsler adult intelligence scale. The question is: how many digits can the person repeat back, without error and in the right order? Recalling the right digits immediately after presentation in the right order is known as immediate serial recall. Recalling the right digits in any order is known as free recall.

The steps are as follows.

1. Assemble the test materials, consisting of several rows of digits of increasing length (see below).
2. The experimenter reads out a row of digits at the rate of about one per second.
3. After the last digit, the participant repeats the numbers back, in the correct order.
4. Continue with the following rows until there is an error.
5. The person's digit span is the number of digits in the last errorless row.

8 4 7 5
1 9 6 4 3
3 6 1 4 5 3
8 2 7 5 9 4 6
2 5 1 4 9 2 3 9
9 4 6 3 6 1 3 2 5
8 5 1 9 4 6 8 2 4 2
4 3 7 2 5 4 3 9 5 4 7

Notice that the graphs in Figures 14.2 and 14.3 have a similar form. The loss of information is initially rapid, followed by a decrease in the rate until the curve flattens out, indicating that very little is lost from then on. This is the classic 'forgetting curve'. However, it doesn't always indicate the same underlying processes. Forgetting from

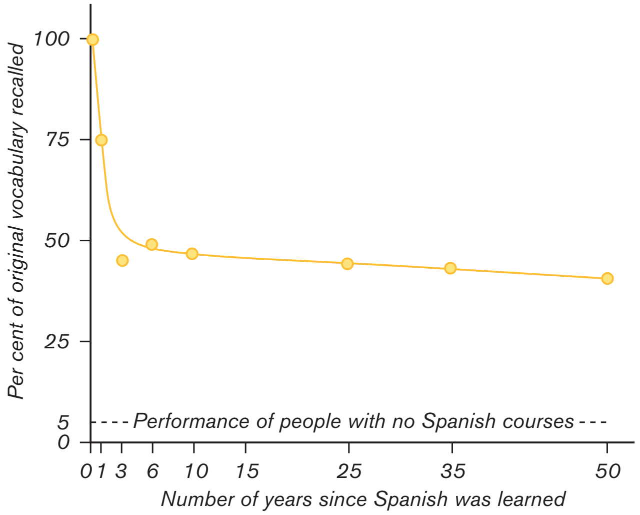

Figure 14.2 Memory for Spanish vocabulary learnt up to 50 years previously
Source: graph adapted by Rubin, 1995, from Bahrick, 1984

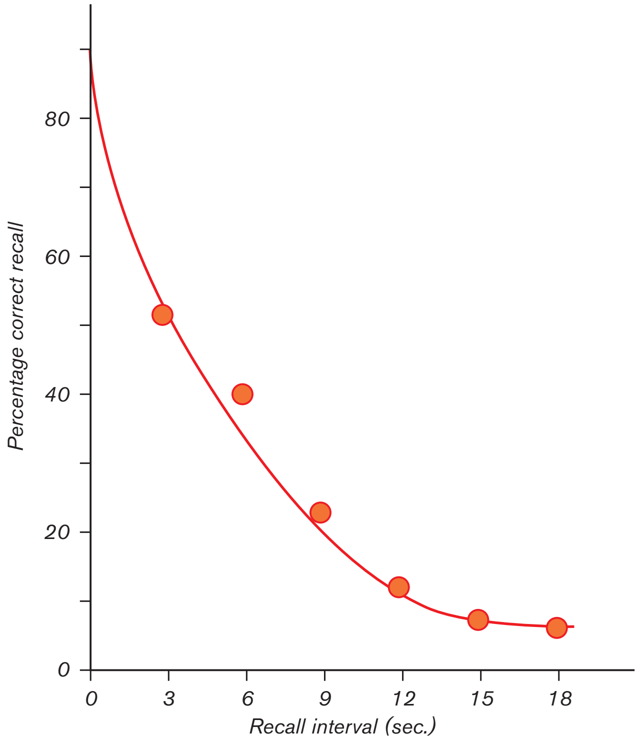

Figure 14.3 Short-term forgetting: the graph shows loss of information from STM over a period of time
Source: Peterson and Peterson, 1959

long-term memory is generally taken to be through interference, with new and old memories becoming confused and eventually irretrievable, while forgetting in short-term memory is generally taken to be through trace decay, with the neural substrate of the memory fading over time or by displacement, with early material being pushed out by recent material.

Encoding

A third potential difference between STM and LTM lies in encoding or the form in which incoming information is held. The two main forms are phonological and semantic encoding. A spoken sentence could be encoded in terms of the speech sounds of the words or in terms of the meaning of the words. The former is referred to as phonological encoding, the latter as semantic encoding.

Generally, encoding is phonological in short-term memory and semantic in long-term memory. This is consistent with our own experiences. If someone gives me their telephone number, I *rehearse* it verbally until I can write it down. But if I want to remember a fact for the longer term then I remember it in terms of the meaning. Interestingly, trying to remember jokes seems to need memory both for the general content of the joke and for the precise wording. A misremembered punchline guarantees puzzled looks and a stony silence.

Evidence for phonological encoding in STM comes from an experiment by Baddeley (1966a), who presented participants with a list of five words (well within the capacity of STM) for immediate serial recall. He found that words that were phonologically similar (man, mad, cap, can, map) were not remembered as well as words that were semantically similar (big, huge, broad, long, tall) or unrelated (pen, rig, day, bar, sup). The similarity of the sounds was disrupting their phonological encoding (see Activity box 14.2).

In a second experiment, he increased the number of words to 10 and inserted an interval between presentation and recall in which rehearsal was prevented. The task now required LTM, first because 10 words exceeds the capacity of STM and, second, because of the interval. The semantically similar list produced the worst performance, indicating the use of semantic encoding in LTM (Baddeley, 1966b).

Serial position effect

A phenomenon that seems to distinguish between STM and LTM is the serial position effect. If participants are presented with a list of 20 words and then asked to recall them in any order (free recall), we find that the first few items and the last few items in the list tend to be remembered better than the middle items – that is, memory depends on the serial position in the list (Glanzer and Cunitz, 1966) (see Figure 14.4).

The enhanced memory for the first few items in the list is called the primacy effect. The enhanced memory for the last few items is called the recency effect. How does this relate to the short-term/long-term memory difference? Basically, the first few items are remembered well because they are transferred to long-term memory as soon as they enter the system. The last few items are remembered well because they are still in short-term memory when the list is being recalled. The middle items suffer because the system becomes overwhelmed trying, simultaneously, to encode, to rehearse and to transfer items to long-term memory. However, this interpretation of the serial position curve needs to be treated with caution because we find recency effects in long-term memory. For example, rugby fans tend to remember the last few games of the season better than those in the middle (Baddeley and Hitch, 1977).

ACTIVITY BOX 14.2

The effect of phonological confusability (Conrad and Hull, 1964)

Read the following letter string once, one letter at a time at the rate of about one letter per second. Then cover the line and write down as many letters as you can, preserving the letter order.

PVBCEDG

How many did you get in the right order?

Now repeat the procedure for this next letter string: RZAFHNL

How many did you get this time? Most people get fewer letters when they rhyme because of the phonological confusability of the first set.

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Neuropsychology

Perhaps the strongest evidence for separate short- and long-term memory systems comes from neuropsychology. The separation is well illustrated in the case of HM, an amnesic very similar to Clive Wearing. HM has been studied for nearly 50 years and has become a celebrity in his own right. Corkin (Postle and Corkin, 1998) has reviewed HM's case

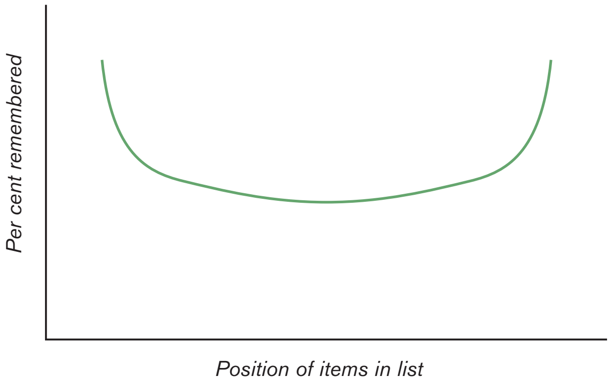


Figure 14.4 Graph of idealised serial position effect

Photo 14.1 Rugby fans tend to remember the last few games best – a recency effect in long-term memory (Baddeley and Hitch, 1977).

since the onset of his amnesia in the 1950s and has found that he did not know where he lived, who cared for him or the date or year. He didn't recognise a picture of himself taken a few years earlier. He didn't remember what he'd seen recently on television and had little awareness of current affairs (e.g. who the current prime minister was). Clearly, his long-term memory is severely impaired.

By the same token, he performed normally on tests of short-term memory such as digit span. Thus HM presents a picture of an intact short-term memory but virtually non-existent long-term memory.

The opposite condition was found in the patient KF (Shallice and Warrington, 1970), who had a normal long-term memory but a severely impaired short-term memory, with a memory span of only one item. The fact that these two people have complementary impairments of short- and long-term memory provides powerful evidence for separate systems (see Research methods box 14.2).

In this section, we have looked at representative evidence for distinguishing short- and long-term memory on the basis of their capacity, the duration of memories and the

RESEARCH METHODS BOX 14.2

Dissociation and double dissociations of function

This is an investigative tool used extensively in the neuropsychology of cognitive function to make inferences about how the mind is organised. Its purpose is to discover whether two sets of structures or processes are independent of each other.

Suppose we are looking for evidence that short-term memory and long-term memory are the products of different sets of cognitive processes – let's call them STM processes and LTM processes. One source of such evidence would be people who, through disease or injury, have suffered brain damage and are cognitively impaired. In particular we would be on the lookout for a person or persons who have a memory problem (and as few other impairments as possible, to keep matters simple). We would be looking specifically for a person with a long-term memory loss. On finding such a person we would give them an extensive battery of tests to measure precisely their pattern of memory impairments. The question would be 'Which aspects of memory have been lost and which aspects preserved?' The pattern we would be looking for is one in which all measures of long-term memory (acquiring new information, remembering recent events etc.) produce poor scores, suggesting an impairment, but one in which measures of short-term memory (e.g. memory span) produce high scores.

The inference to be drawn would be that the two sets of functions are dissociated, or separated, from each other. The existence of this case would be evidence for a dissociation of the functions of short-term and long-term memory.

It could, however, be argued that the result could be due to something other than different sets of processes that were differentially impaired. The most obvious one is that perhaps the tests of long-term memory were harder than those of short-term memory. The person concerned was therefore able to do the latter but not the former. The objection would effectively be refuted if we then found another patient with the reverse pattern of impairment. That is, someone who failed all the tests of short-term memory, indicating an impairment, but who passed all the tests of long-term memory. The task difficulty explanation falls down because this patient has passed the hard tests and failed the easy ones. The separate processes explanation survives.

Either one of these patients on his/her own constitutes a dissociation of function. Together they constitute a double dissociation of function. The principle underlying dissociation of function applies to any area of cognitive psychology, not just memory. It is a much used methodological investigative tool in cognitive neuropsychology. Notice the similarity between dissociation of function and the dual-task paradigm (see Chapter 13). They both provide evidence that two sets of processes are independent of each other, one by making inferences from a pattern of impairment and the other from the pattern of response to doing two tasks at the same time.

coding system. We also reported ambiguous evidence from the serial position effect and powerful evidence from neuropsychology.

Self-test: In what ways do short- and long-term memory differ?

Three models of short-term memory

Modal model of memory

An early model of short- and long-term memory was that of Atkinson and Shiffrin (1968), which was developed specifically to account for the results just reported (see Figure 14.5). The sensory store of the model has been briefly described already.

In the modal model of memory, STM and LTM are presented as connected memory stores, the characteristics of which were outlined earlier. In addition, the short-term store has a number of control processes such as rehearsal, coding and retrieval. Rehearsal is the means by which information is moved into the long-term store, while retrieval is the process by which required information is fetched from its home in the long-term store. Information is lost from STM by trace decay and from LTM by interference.

There were several problems with this model. The claim that information had to pass through STM to reach LTM was wrong. The patient KF (see earlier), who had a badly impaired STM, was still able to acquire and retain new information in LTM. According to the modal model, which says that information has to pass through STM to reach LTM, this should not have happened.

In addition, rehearsal does not play such an important role in LTM as the model suggested. Most of what we remember is encoded automatically; we don't go around making a point of trying to remember the events in our lives by rehearsing them. Note that these criticisms are not discounting the existence of short- and long-term stores, merely this model of them.

Another major problem with the modal model was that although it identified 'control processes' such as decision making, the short-term store didn't really seem to have a purpose, other than to remember telephone numbers!

In contrast, an alternative model proposed by Baddeley and Hitch (1974) asked specifically what short-term memory is for (see Activity box 14.3). They explored the role of STM in everyday cognitive tasks such as understanding spoken sentences and verbal reasoning. They approached the general problem by asking participants to carry out cognitive tasks such as prose comprehension and simple reasoning, while simultaneously remembering a set of digits. What they found was that while performance on the cognitive task was impaired by the simultaneous digit load, the impairment was much less than expected from the Atkinson and Shiffrin model. Atkinson and Shiffrin would predict that the digits would

ACTIVITY BOX 14.3

Doing two tasks simultaneously.

The purpose of this activity is for you to get a feel for the role of short-term memory in spelling. You'll need a friend to help.

1. Condition 1: spell one of the words listed below.
2. Condition 2: ask your friend to read out a set of the random digits below. Your task is to hold them in your short-term memory using rehearsal. Once you've begun rehearsing the digits, he or she should then say a (different) word to be spelt.
3. Condition 3: ask your friend to read out a set of random letters. Again, when you're rehearsing he or she reads out another word to be spelt.

Now rank these three tasks in order of difficulty. Which was the easiest? Why?

Words to be spelt: contribution, retribution, attribution

Random digit string: 824963

Random letter string: rfknvj

Answers at the end of the section

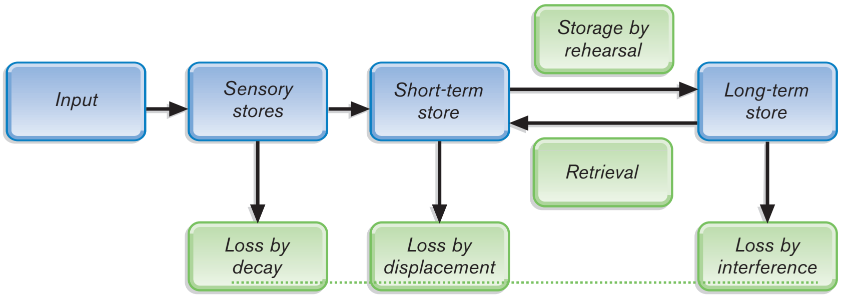


Figure 14.5 Atkinson and Shiffrin's (1968) modal model of memory: this was developed to account for all the research at the time; it consisted of three memory stores with information that wasn't lost en route passing sequentially through the three stores

fill the short-term store, leaving no space for the requirements of the cognitive task. This, in turn, should lead to badly impaired performance on the cognitive task. This did not happen, suggesting that the structure of memory envisioned by Atkinson and Shiffrin (1968) was wrong. These experiments were the beginning of the working memory model (Baddeley, 1986, 1998; Baddeley and Hitch, 1974).

Self-test: How does short-term memory in the modal model differ from working memory?

Working memory

In the working memory model the notion of a single, passive holding store (STM) is replaced by a multicomponent system with interacting storage and processing components. It is an active system, geared towards carrying out cognitive processing. We can see that this concept is closer to William James's idea that primary memory is related to consciousness.

In its simplest form, working memory (WM) has three components (see Figure 14.6). First, there is the central executive, which, as its name implies, oversees the processing of information. It focuses attention and allocates resources to the task in hand. It is an online supervisor of cognitive function.

The central executive is served by two slave systems. One of these is the phonological loop. This is a speech-based short-term store with a limited capacity, limited duration (assuming rehearsal is prevented) and phonological encoding. It is similar to the kind of short-term store we've been discussing and therefore accounts for the experimental findings described earlier. The other slave system is the visuospatial scratchpad. This is a short-term store for visual information. It expands the horizons of the model beyond verbal memory. It is the locus of visual imagery and plays an important role in the processing of visual information. To get an idea of the kind of task it might be used for, ask yourself this question: 'How many windows are there in my house?' How did you answer it? You almost certainly visualised each room in your house in turn, counting the windows as you went, thus using the visuospatial scratchpad.

Further details of working memory can be found in Baddeley (1997). An evaluation can be found in Eysenck and Keane (2005). A major criticism of WM is that the phonological loop and the visuospatial scratchpad do not seem to play as significant a role in cognitive processing as was expected and that cognitive processing is too often hypothesised to occur in the central executive, about which very little is known (Donald, 1991). However, Applications box 14.1 gives a brief description of how the model has been useful.

APPLICATIONS BOX 14.1

Working memory and learning vocabulary

Gathercole and Baddeley (1989) were investigating a cohort of language-disordered children who had normal non-verbal intelligence but delayed language. They were about two years behind on reading, vocabulary and spelling, and about four years behind on non-word repetition. Non-word repetition is a simple task in which the child is asked to repeat back to the experimenter a set of non-words such as ledmond and bavsimp. Non-word repetition is hypothesised to require efficient operation of the phonological loop.

The co-occurrence of poor non-word repetition and poor performance on language tasks alerted Gathercole and Baddeley to the possibility that there might be a causal relationship – that is, impaired non-word repetition, and hence an impaired phonological loop, might be the reason why these children's vocabulary development was delayed.

Using this information, they tested a group of 100 normal four- to five-year-old children and found a significant correlation between non-word repetition and vocabulary size, both at the start of the study and at subsequent follow-ups. Thus it seems that the phonological loop may be involved in the acquisition of a vocabulary.

Levels of processing

An alternative to the two-memory view (short and long term) is the idea that memory consists of one system and that differences between short- and long-term memory can be explained in terms of levels of processing (Craik and Lockhart, 1972). This idea holds that shallow processing – processing of superficial perceptual aspects of the to-be-remembered stimulus (e.g. the appearance or sound of words) – would lead to short-term retention and that deep processing – processing of the meaning – would lead to

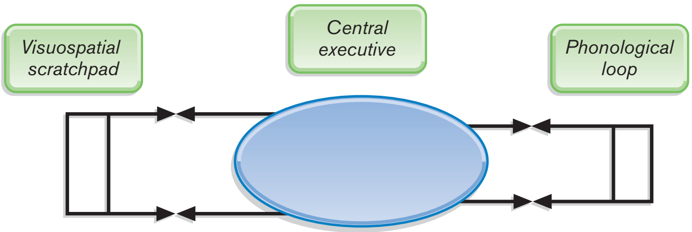


Figure 14.6 Working memory model: this consists of a central processor or executive served by two slave systems – a phonological loop and a visuospatial scratchpad
Source: Baddeley, 1997: 52

long-term retention. In a typical experiment, Craik and Tulving (1975) gave one group of subjects a list of words such as 'rain' and then required them simply to say whether each word was written in upper or lower case. This task required visual processing. In a second condition, the same words were presented to different subjects and they had to say whether each word rhymed with another word (e.g. pain with rain). This required sound processing. In a third condition, a different group of subjects were asked to say whether each word fitted a sentence or not e.g. 'The rain fell mainly over the hills.' This required semantic processing. None of the subjects was told that their memory for these words would be tested later. In a subsequent, unexpected, memory test the semantic group did best (deepest processing), the sound group next best and the visual group least well (shallowest processing).

The problem with the levels of processing idea is that there is no independent way of distinguishing between deep and shallow processes. Consequently, the predictions made are circular: shallow processing leads to poorer memory than deep processing, but the way that shallow and deep processes are distinguished is by the fact that they lead to differences in memory!

Self-test: How does the levels of processing model of memory differ from both the modal model and working memory?

Long-term memory: encoding, retrieval and forgetting

Long-term memory is a system with a large – perhaps infinite – capacity. It uses semantic encoding of information and has a duration that can be a lifetime. This section examines the processes of encoding (or learning), of remembering and of forgetting. Again, the research is overwhelmingly verbal in nature but the assumption is that the principles generalise to non-verbal memory systems.

Encoding

Organisation

There is considerable evidence that the key to remembering complex information is to organise it. Many students arrive at this conclusion on their own, covering their walls in the pre-examination period with diagrams, boxes and arrows to denote the key topics and the relationship between them. In the laboratory, Bousfield (1953) showed that memory for 60 categorised words (names of animals, vegetables, professions and boys) presented randomly was better than for 60 random words. Also, the words were remembered in semantically related clusters (e.g. some animal names together and so on). Bower et al. (1969) showed that words presented in a hierarchical organisation were remembered better than the same words presented randomly (see Figure 14.7).

Perhaps most impressively, Mandler (1967) showed that instructions to organise were as effective as instructions to learn. One group of participants was given a pack of cards, with one word on each, and asked to sort (organise) the pack in a meaningful way (e.g. groups of related words together). Nothing was said about subsequent recall. A second group was instructed to learn the words for subsequent recall. A third group was told both to organise and learn. There was no difference in the amount recalled between groups.

The performance of the first group is a strong illustration of the power of organisation and of incidental learning, in which we acquire memories without having any intention to do so. We all know that we don't go around constantly making decisions about whether or not we want to

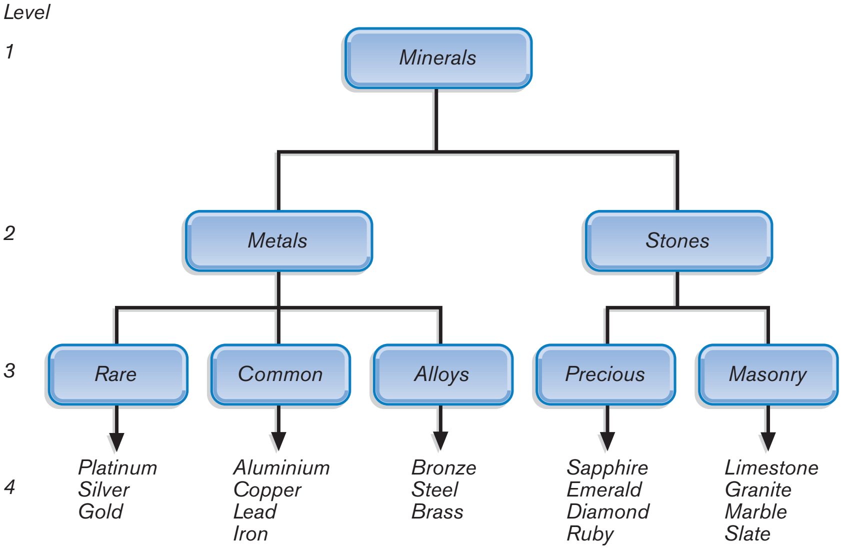


Figure 14.7 Presentation of materials in a hierarchical structure
Source: reprinted from *Journal of Verbal Learning and Verbal Behavior*, 8, Bower et al, 'Hierarchical retrieval schemes in recall of categorized word list', 323–43, copyright 1969, with permission from Elsevier

remember a particular event. These incidental memories are the product of what Hasher and Zacks (1984) have called automatic processing, to be distinguished from the conscious effortful processing that we engage in when, say, learning for an exam. (See Chapter 13 for more on the distinction between automatic and effortful or controlled processing.) (See Applications box 14.2.)

An important determinant of organisation is the presence of a schema, or mental framework, to guide it. A schema is an organised pattern of thought about some aspect of the world, such as class of people, events, situations or objects (Bartlett, 1932). For example, proficient chess players acquire a chess schema, composed of strategies, situations and past experiences, which they have acquired over years and which they use to guide their play. Chase and Simon (1973) gave an expert, an intermediate and a novice chess player a few seconds to look at a chessboard with about 25 pieces and then reproduce the positions. When the positions were meaningful (as in a game) the expert remembered them best and the novice worst. When the pieces were randomly arranged, however, all three players remembered them equally badly (about three pieces). In the first situation, the expert's schema was usable and helped him encode the positions, but in the second case, it wasn't.

ACTIVITY BOX 14.4

Using mnemonics to learn the STM/LTM distinction

We have outlined three mnemonic strategies to remember information that can be put into a list: the method of loci, reduction coding, which produces an acronym, and elaboration coding involving a rhyme.

Now look back at the section that reviewed the evidence for distinguishing short-term and long-term memory. This consists of a series of discrete points that form a list. You should be able to apply each of the aforementioned mnemonic strategies to this list. Apply each strategy in turn and decide which you think would be the easiest to use, and which would be the most effective if you were working for an exam and anticipated a question on the STM/LTM distinction.

Mnemonics

The use of mnemonics to remember information was of particular help when the majority of people were illiterate and writing tools were cumbersome. Nowadays, we have so many recording devices that the use of mnemonics is more like a party trick. Some, however, can still be useful (see Activity box 14.4).

One of the best known mnemonic systems is the method of loci, used by Roman orators to remember the key points of their speeches. The technique involves visualising a walk through the rooms in a 'memory theatre', leaving one of the key topics at each location. So, if the speech were to argue against a war that Caesar was about to wage, the orator might visualise leaving a sack of money in the first room to represent the costs of the war, a woman crying over her dead son in the next room to represent the possible consequences and so on.

Another strategy used by many students (Soler and Ruiz, 1996) consists of reducing what is to be remembered to a few key points and then encoding these with an acronym (e.g. the colours of the rainbow as ROYGBIV). It is an example of a reduction mnemonic.

APPLICATIONS BOX 14.2

Improving memory for medical instructions

How well do you remember instructions given to you by your doctor? According to a review by Ley (1988), not very well. In a survey of studies looking at this it emerged that you are likely to remember about half of what you're told. Clearly, the information you get from your doctor is important and could be critical.

Ley, a clinical psychologist, looked at different ways in which patients' memory for information and instructions could be improved. In one study, making use of what we know about the primacy effect, he presented the important information at the beginning. There was a significant improvement in memory (Ley, 1972). In another study he found that advice was remembered best if it was explicit rather than general: 'You must weigh yourself every Saturday and lose eight pounds by 30 June', rather than 'You must weigh yourself regularly and lose some weight' (Bradshaw, Ley, Kincey and Bradshaw, 1975).

In another study he used the evidence that categorising information enhanced memory. So the instructions went like this: 'I am going to tell you what is wrong, then what tests you need to have, then what the treatment will be. First, what is wrong with you: I think you have bronchitis. Second, what tests you need: some X-rays and a blood test. Third, the treatment I'm going to give you: an antibiotic, which I want you to take three times a day after having eaten something.' Again, memory for this information was improved significantly (after Baddeley, 1997).

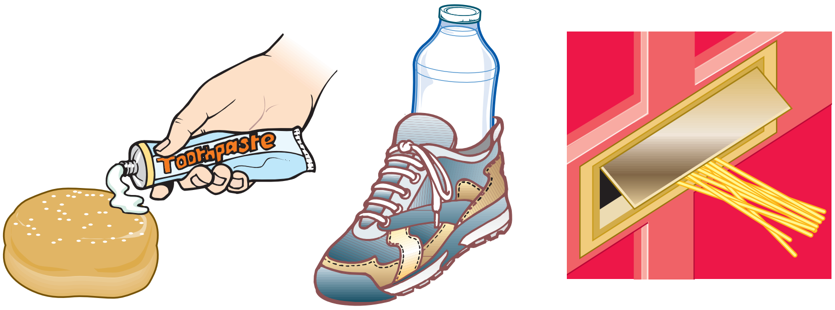


Figure 14.8 An example of an imaging technique that might be used in an elaboration mnemonic

A third technique uses an elaboration mnemonic. You may have come across this rhyme:

One is a bun.
Two is a shoe.
Three is a tree.
Four is a door.
Five is a hive.
Six is sticks.
Seven is heaven.
Eight is a gate.
Nine is wine.
Ten is a hen.

The idea, if you're trying to remember something like a short shopping list, is to associate each item on the list with each line of the rhyme, using bizarre images. Thus for toothpaste you might imagine eating a bun spread with toothpaste; for a bottle of milk you might imagine stuffing it into your shoes and so on (see Figure 14.8). When the time to remember comes, you recite the poem and up pop the items you want.

Notice that mnemonic devices work because they function as retrieval cues that enable you to access the information you want. They don't affect the amount of information that is learnt.

Self-test: What factors govern the encoding of information into long-term memory?

Retrieval

Retrieval cues

How do we remember? One of the most important determinants of retrieving information from long-term memory is the presence of a retrieval cue. This is simply a piece of information, related to the memory in some way, which enables the memory to be found and retrieved. So if I wanted you to tell me about a film you'd seen last month, I would have to identify it in some way. The title is obviously one retrieval cue but if I didn't know it, then I might say: 'Tell me about the film you saw last Thursday with Rebecca and John.' Of course, if you'd been to a film festival, I would need to be even more specific.

Endel Tulving has shown in a series of experiments over many years that appropriate retrieval cues are essential for the retrieval of memories (Tulving and Osler, 1968; Tulving and Psotka, 1971; Tulving and Thompson, 1973).

Tulving distinguished between the availability of memories (they are 'in there somewhere') and the accessibility of memories (whether they can or can't be accessed on a particular occasion). Retrieval cues make available memories accessible. In one experiment (Tulving and Pearlstone, 1966), participants were asked to remember a list of words that could be (but weren't) categorised (e.g. names of animals, names of metals). After learning the list, the subjects recalled as much as they could. They were then given the category names (animals, metals, transport) as retrieval cues and this enabled them to remember items they hadn't remembered previously.

A particularly interesting retrieval cue is context: where and when an event occurred. We all know that memory of an experience is improved by information about when it occurred, where it occurred, who we were with at the time and so on. One of the most spectacular experiments on context was carried out by Godden and Baddeley (1975). They found that divers who were asked to learn a wordlist on land remembered it better on land than underwater,

Photo 14.2 Endel Tulving.

while a list learned underwater was remembered better underwater than on land. This is a classic example of context-dependent memory. This is when something experienced in a particular context is best remembered in that same context.

Another kind of context is one's internal state. Goodwin et al. (1969) found that what their subjects learned while drunk they remembered better when drunk than when sober. Conversely, what they learned sober was better remembered when sober than when drunk. This is an example of state-dependent memory. Experiments involving a variety of other drugs, including caffeine, have found the same effect of internal state (e.g. Carter and Cassaday, 1998).

Similar findings exist for mood-dependent memory (e.g. happiness and sadness). These ideas were formalised by Tulving (Tulving, 1983; Tulving and Osler, 1968) into his encoding specificity principle, which states that a retrieval cue is successful only if it is present at the time of encoding, i.e., the more the conditions at retrieval resemble those at encoding, the more likely is a successful retrieval.

Self-test:

- What is the difference between an accessible memory and an available memory?
- What is the encoding specificity principle (ESP)? How does it explain the effects of context, mood and state?

Constructive memory

An important characteristic of memory and remembering is that it is a constructive process. We don't just faithfully report the contents of a memory trace, which is probably sketchy and incomplete – we construct the memory from what is stored and from relevant schemata we may have, adding or changing details to produce a plausible outcome. We add in our own details and interpretations so that things make sense (Bartlett, 1932; Neisser, 1984; Schacter et al., 1998).

Photo 14.3 This still from the film *City Lights* illustrates state-dependent memory. A drunken millionaire spends the evening drinking with Charlie Chaplin's character after Chaplin saves his life. The next day the millionaire is sober, doesn't recognise Chaplin and kicks him out. On getting drunk, he remembers Chaplain again. Source: Passer and Smith, 2001: 292

For example, we have schemata for different kinds of robbery (bank robberies, muggings and so on), which consist of stereotypic characters performing stereotypic actions in a predictable sequence. When a robbery deviates from this we tend to distort what we recall to fit the schema of the robbery rather than what we actually witnessed (Holst and Bezdek, 1992).

Forgetting

How do we forget? Perhaps the best known theory of motivated forgetting is Freud's theory of repression. This states that forgetting occurs because memories are emotionally painful, the remnants of a trauma or unpleasant event. In an effort to cope with the emotional pain, the mind represses the memory. The main problem with this theory is that it doesn't explain the vast amount of forgetting of mundane events that occurs daily.

An early alternative to repression is trace decay (Broadbent, 1958; Ebbinghaus, 1885). The idea here is that a memory is laid down in the brain as a memory trace, a physiological or chemical change, which is subject to 'decay' (i.e. a reversal of the change, over time). However, this theory leaves a lot of unanswered questions, such as why some memories should decay while others are retained for years. Neither does it allow for the fact that forgetting may occur because of the intervention of other events.

Interference theory argues that memories are subject to interference from other memories and that we forget because they become entangled with both earlier and later memories. Early researchers identified two types of interference: proactive interference and retroactive interference (McGeogh and McDonald, 1931; Underwood, 1957) (see Figure 14.9).

Suppose a participant sees two science fiction films. Proactive interference (Figure 14.9a) occurs when s/he is tested on his/her memory for the second film and the first film acts 'forward' in time to interfere with his/her memory of it. Retroactive interference (Figure 14.9b) occurs in the same scenario when the participant is tested on his/her memory of the first film, which has been interfered with by the second film.

Consider the following example. Suppose you saw a science fiction film a month ago and another one a week ago and suppose that, on different occasions, you are asked to describe both films. If, when describing the first film, you left out bits because your memory system had them coded as coming from the second film or if you brought bits of the second film into your description of the first film, then you would be experiencing retroactive interference. Memories of the second film would be working retroactively (backwards) to interfere with memories of the first film. Similarly, if your description of the second film were being affected by memories of the first film, you would be experiencing proactive interference.

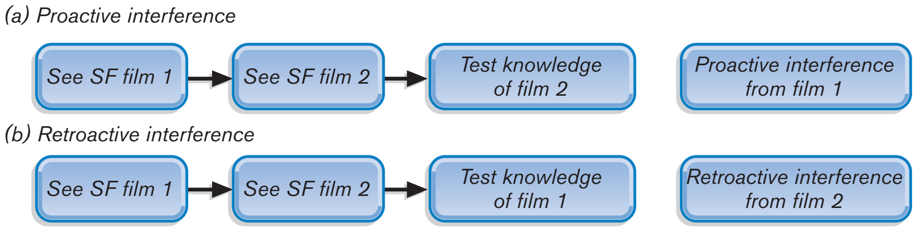

(a) Proactive interference
See SF film 1
See SF film 2
Test knowledge of film 2
Proactive interference from film 1
(b) Retroactive interference
See SF film 1
See SF film 2
Test knowledge of film 1
Retroactive interference from film 2

Figure 14.9 Diagrammatic representation of the difference between proactive and retroactive interference

An important determinant of interference is the similarity of the memories. You are far more likely to experience interference between two science fiction films than between a science fiction film and a musical. Interference theory provides a very powerful account of forgetting and explains the common experience of confusing memories.

Forgetting can also be thought of simply as a failure to retrieve a memory from storage. As we saw in the section on remembering, this often occurs in the absence of the appropriate retrieval cue. A forgotten memory is one that is available but not (currently) accessible. A major problem with this theory is that it is impossible to prove wrong. You could spend years trying to remember a particular piece of information, trying every possible retrieval cue, but your claim that you had forgotten the information (i.e. it was gone for ever) would be met with the argument that you simply hadn't found the right retrieval cue and should keep trying! Nevertheless, it is true that a failure to remember is temporary and that the forgotten information can be retrieved on another occasion. In general, interference and retrieval failure are compatible and complementary theories of forgetting. (See Class activity box 14.1 for some memory exercises.)

Self-test: What are the theories that claim to explain forgetting?

CLASS ACTIVITY BOX 14.1

Memory

[These exercises are designed for group work in seminars. They rely on the tutor being available to help and to discuss the purpose of the exercise and its implications.]

The aims of the activities that follow are to help you develop (1) an understanding of key topics in this area and (2) your expertise in simple experimental design. Work in groups and, in each case, restrict your design to *one* independent variable and keep the number of levels to two or three. Be aware that you may often need a control group. You may consult your lectures notes or any other information you have to hand.

1. Levels of processing. Craik and Lockhart (1972) proposed that memory is an incidental consequence of the depth to which material is processed. This would predict that memory for faces would depend on the depth to which processing had occurred:
   1. Outline an appropriate experiment to show the LoP effect in face recognition.
   2. Name the independent variable.
   3. Identify the levels of the independent variable.
   4. Identify your dependent variable and how it will be measured.
   5. State briefly what you would expect to find and why?
   6. Explain why you think the orienting tasks you have chosen vary in depth.
   7. Draw a graph of the expected results.
2. Remembering. Tulving has emphasised the importance of retrieval cues in remembering because they help to search memory. Suppose you are trying to remember the names of people you've met over the last year. Tulving would argue that using several retrieval cues is better than using none or even one because each retrieval cue is likely to produce some names that the others haven't succeeded in eliciting:
   1. Outline an appropriate experiment to test the hypothesis. (*Hint*: consider that you meet people of different ages and in different locations.)
   2. Name the independent variable.
   3. Identify the levels of the independent variable.
   4. Identify your dependent variable and how it will be measured.
   5. State briefly what you would expect to find and why?
   6. Draw a graph of the expected results.
3. Forgetting. Retroactive interference explains how, in eyewitness testimony for example, misleading information can affect eyewitness testimony by distorting the prior memory. Using memory for episodes of your favourite soap operas, sketch out a simple experiment that will show the effects of retroactive interference:
   1. Name the independent variable.
   2. Identify the levels of the independent variable.
   3. Identify your dependent variable and say how it will be measured.
   4. State briefly what you would expect to find and why?
   5. Draw a bar graph of the expected results.

answers at the end of the section

Autobiographical memory (AM)

The nature of AM

Autobiographical memory is memory for biographical information and for life experiences. It's your personal memory system, containing information about you and your experiences. At first glance it seems obviously related to Tulving's notion of episodic memory, and many researchers, including Nelson (1989), have thought of it in this way. However, Robinson (1992) points out that we need to distinguish between our autobiographical knowledge and memories for autobiographical episodes.

Autobiographical knowledge is information about where and when you were born, your educational history, places you've lived in, your work history, your marriage and children. Your memory for autobiographic episodes is, in contrast, less systematic and more idiosyncratic, involving descriptions about specific episodes in your life that you remember particularly well.

Tulving et al. (1988) describe a head-injured patient who knows his life history but cannot remember any specific episodes from it. This suggests that even though episodes overlap, biographical information has its roots in semantic memory while autobiographical episodes are rooted in episodic memory. Another piece of evidence that autobiographical memory is a system in its own right comes from De Renzi et al. (1987), who report a patient who had lost much of episodic and semantic memory but whose autobiographical memory was preserved.

Distribution of AM memories over the lifespan

How much of the past do we remember? Rubin et al. (1986) collected the results from several studies that presented participants with cue words such as 'friend', 'home' and 'work' and asked them to respond with memories evoked by these cue words. In response to the cue 'friend', for instance, you might recall a school friend you haven't seen for some years. Their participants were 50 and 70 years old. When combined, the results of these studies showed that memories were not distributed evenly over the lifespan (see Figure 14.10).

Rubin et al. identified three components. First, there was a retention function for the most recent memories. Recent memories were remembered best, dropping off to when the person was about 40–50 years old. Second, there was a rise in memories from the 20s; they called this a reminiscence bump, reflecting a person's tendency to reminisce about events during their youth (see Figure 14.10). Third, there was amnesia for the early years of childhood, with few memories from the preschool years (see Applications box 14.3).

Several researchers have speculated about the causes of childhood amnesia. There is the Freudian explanation that childhood is full of guilty memories about the anal and genital stages and that these have been repressed. A more plausible explanation is by Schactel (1947), who argued that memories are coded in different ways before and after children acquire language. Young children's experiences are perceptual before language acquisition, and cognitive and linguistic after acquisition. They lose their ability to retrieve these early memories after the change.

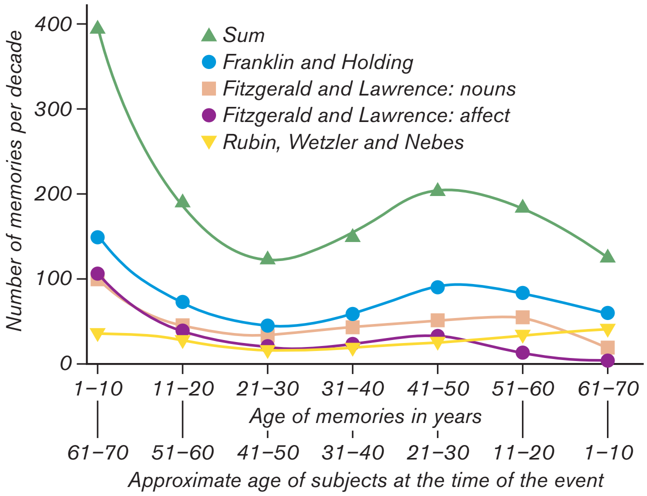


Figure 14.10 Distribution of autobiographical memories over the life span: the graph plots the number of memories remembered from different times in a person's life (lower scale); see text for comments

Source: Rubin et al., 1986

Flashbulb memories

Do we remember emotionally charged events particularly well? Flashbulb memories are memories for dramatic, surprising, important and emotionally arousing events. Brown and Kulik (1977) reported participants' memories for the assassination of President Kennedy in November 1963. They were able to remember where they were, what they were doing, who told them, what they felt and what happened next. Brown and Kulik (1977) argued that the event was so spectacular that it was caused to be printed on the brain (hence the term flashbulb memory). More recent events like this are the death of Princess Diana and the events of 9/11 (see Activity box 14.5).

Neisser (1982) disputed the 'flashbulb' interpretation, however. His research found that such memories were not as accurate as they were claimed to be and that they were remembered vividly because they were the kind of event that would be discussed for many years after. Rubin and Kozin (1984) asked their participants about personally significant flashbulb events (accidents, injuries and encounters with sexual connotations predominated). The vividness of the memories was related to surprise, emotionality and personal importance.

Forgetting in AM

What about forgetting? Linton (1975) and Wagenaar (1986) both kept diaries about daily events over a period of 6 years. They thus overcame the verification problem of

APPLICATIONS BOX 14.3

Eyewitness testimony

How big is the problem of inaccurate eyewitness testimonies? Wells (1993) has estimated that it is the largest factor in miscarriages of justice. However, estimating the real extent of the problem accurately is difficult because there needs to be independent evidence of the error and this is not often available, e.g. the witness testifies to having seen the defendant commit the crime but the defendant is subsequently found to have a cast-iron alibi.

The importance of knowing how accurate memory is when testifying in a court of law is illustrated by a case described by Loftus (1979). An assistant manager of a small-town store in the USA was kidnapped by two men. They drove him to his place of work and demanded he open the safe. He managed to get a glimpse of them before they pulled on their masks. Fortunately, he managed to convince them that he didn't know the combination to the safe and they let him go. He was able to give a description of one of the men and said that he looked like someone who had recently applied for a job at the store. Three days later the police stopped and arrested Sandie and Lonnie Sawyer, who were driving a similar car but neither of whom looked anything like the photofit that had been constructed. At the trial, the store manager identified the couple as the men who had abducted him and in spite of eight witnesses who testified that they had been elsewhere, they were convicted. The story ends happily because a year later the abductors were tracked down by a private investigator and the Sawyers subsequently released.

The question that immediately arises is: how did the victim make such a catastrophic mistake of identification? Was it because he had been intimidated by the police, who wanted a quick result? Or was it a genuine case of misidentification? (If the latter, what kind of memory factors were responsible?) Perhaps it was a combination of these explanations. The fact that eyewitness testimony can be so unreliable, for a host of reasons, makes it a prime case for psychological investigation.

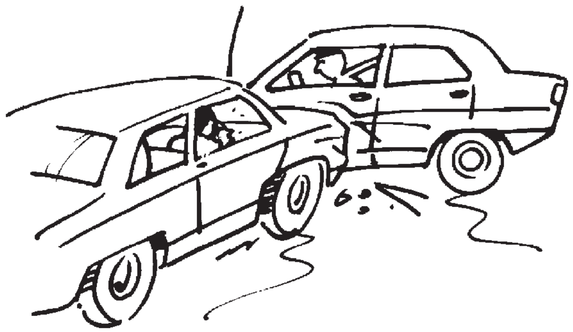
The American psychologist Elizabeth Loftus is perhaps the most renowned expert witness in psychology and has been called on in numerous court cases to inform judges and juries about what needs to be taken into consideration when deciding on the reliability of an eyewitness testimony.

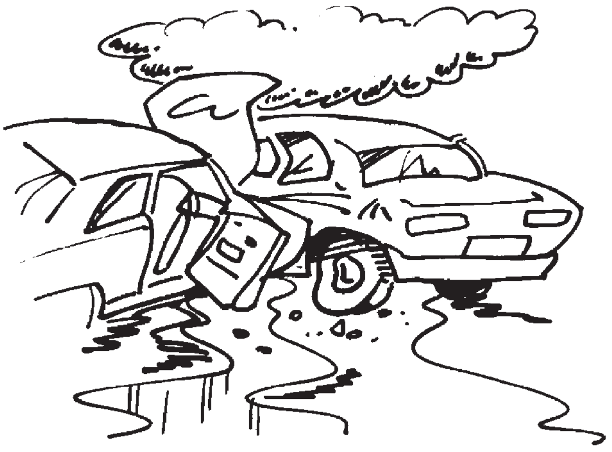
The work for which she is best known looked at the degree to which misleading questions about an event can affect a witness's memory for that event. Briefly, she (Loftus and Palmer, 1974) showed undergraduate students film of two car accidents, after which they were asked questions about what they had seen. Some participants were asked, 'about how fast were the cars going when they smashed into each other?' Other participants were asked the same question, but the words 'smashed into' were replaced with 'contacted' or 'hit' or 'bumped' or 'collided with'. Participants were then asked to estimate the speed at which the cars were travelling. This varied from 32 mph for 'contacted' to 41 mph for 'smashed into'.

In a later, similar experiment, participants were more likely to report seeing broken glass after the collision if the question had used the words 'smashed into' than if it had used the word 'hit'.

The important conclusion to draw from this is that when we report the contents of our memories, we are not simply reporting what is in the memory trace of that event. Instead, memory is more an act of reconstruction, which is susceptible to inaccuracy, distortion and confusion with subsequent events.

Other similar research has found a number of factors that bias eyewitness testimony (see Herrmann et al. (2006) for a fuller list). One important factor is whether





APPLICATIONS BOX 14.3 (CONTINUED)

the defendant fits a stereotype (e.g. Loftus et al., 1987). Given this, you might like to consider the implications of the ethnic, gender, class and age stereotypes we all hold for eyewitness accounts of crimes such as mugging.

Finally, however, we need to be cautious in concluding that eyewitness testimony is inherently unreliable. Most of the research is based on laboratory experiments and this may not hold in the real world. Thus Yuille and Catshall (1986) interviewed witnesses to a murder and found a high degree of consistency in the eyewitness reports and good recollection over time (see the section on flashbulb memory for a possible explanation). Also, Ridley and Clifford (2003) found that higher levels of anxiety decreased susceptibility to misleading questions. There is a long way to go before the casebook on eyewitness testimony can be closed.

ACTIVITY BOX 14.5

Remembering Diana

Think back to when you heard about Princess Diana's death in 1997 and then answer the following questions.

1. Where were you?
2. What were you doing?
3. Who told you?
4. What did you feel?
5. What did you do next?

Try to verify the accuracy of your answers by checking with other people.

Photo 14.4

Remembering 9/11

Again, think back to when you heard about 9/11 in 2001 and then answer the same questions. Again, compare answers with other members of your group. What do you think Neisser's proposal that events of this kind are only remembered so well because they have been seen and discussed many times?

How does your memory for personally vivid events (e.g. birth of a sibling) compare?

studying autobiographical memory. How do you know if your memory is correct or not?

Linton (1975) found that repetitive events such as attending meetings quickly merged and she was unable to remember specific examples of these so-called repisodes. Trivial events were completely forgotten, with no recollection of them at all. Surprisingly, events she rated as being important and emotional when they occurred were not remembered particularly well either.

Wagenaar's (1986) diary recorded the what, when, where and who of an event. Subsequently, he used these cues to try to recall an event. He found the 'what' cue best for prompting recall, followed by the 'where' and 'who'. The 'when' cue was almost useless, suggesting that autobiographical memories are not organised by time. He also found that the more recall cues he gave himself, the more likely he was to remember an event. Most interestingly, there were some events of which he had no recollection at all but by accident someone provided him with a cue that enabled him to remember them. Perhaps forgetting *is* only a matter of not having the right retrieval cue.

Self-test:

- Which theory of forgetting explains the effects of misleading questions on eyewitness testimony?
- What is the difference between autobiographical knowledge and autobiographical episodes?
- What are the characteristics of forgetting from autobiographical memory?

Semantic memory – representing knowledge

Concepts

How are concepts represented in memory? How is the knowledge that a canary is a bird, small and yellow with feathers, two legs and a beak represented in our minds? In this section, we consider major theories that address this question.

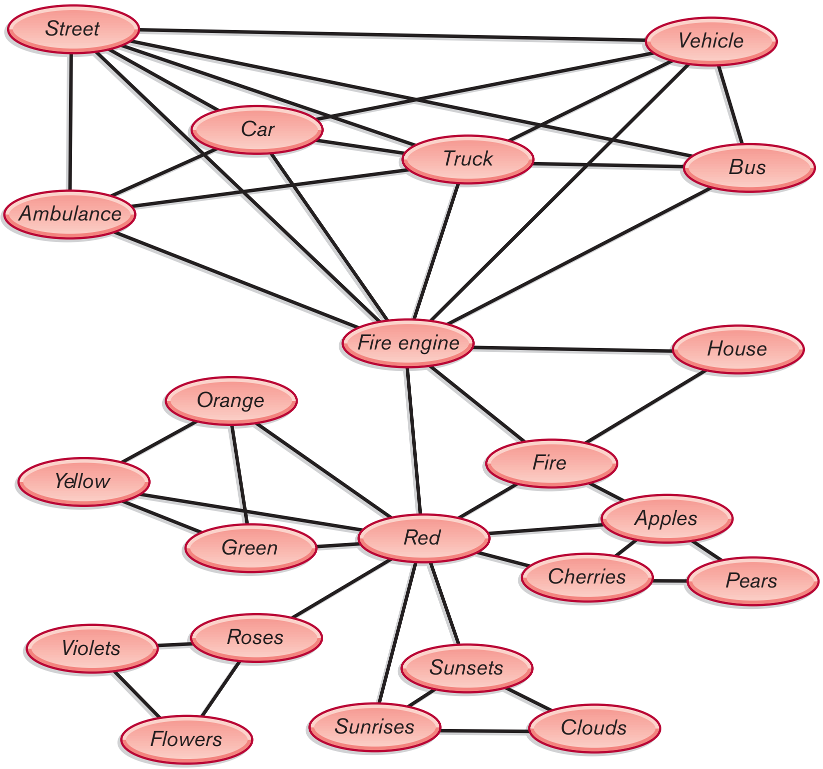


Figure 14.11 Spreading activation model: concepts are represented by nodes, and associations between concepts by links between nodes
Source: Collins and Loftus, 1975

An associative network model of semantic memory

Collins and Loftus (1975) produced the spreading activation model, a very influential version of an associative network model. In an associative network model, concepts are represented by the nodes of a network and the relationship between concepts by the links between the nodes (see Figure 14.11). Associative network models focus on the relationships or links between concepts. These links are associative in nature. For example, fire engine is associated with the concepts 'red' and 'fire'; it is also similar to other vehicles such as an ambulance and a truck. These associations are represented by direct links between the node for fire engine and nodes for these other concepts.

In the spreading activation model, the strength of the association is represented by the length of the link. Short links are strong associations and long links weak ones. In addition, concepts can be linked through 'mediating' concepts. In developing an associative network model containing, say, the concept 'fire engine', a sample of people are asked to write down all the characteristics of a fire engine they can think of. The frequencies with which characteristics are mentioned are then used to construct a network in which some nodes will be connected directly, others indirectly and in which the length of the links reflects the strength of the semantic association.

The spreading activation model was developed to explain the typicality effect, one of the most robust findings in psychology (see Activity box 14.6).

It is more probable that the list of birds you compiled in doing Activity box 14.6 included robin but not penguin, sparrow but not ostrich. Robins and sparrows are typical birds but penguins and ostriches are not. If you were constructing your own associative network of birds then this would be reflected in the relative lengths of the links between bird and robin (short) and bird and ostrich (long). Similarly, dog and cat are typical mammals, while whale and bat are not.

How does the associative network model work? How can it answer a question like 'is a dog a mammal?' Collins and Loftus argue that it does so through spreading activation. The dog node is activated by the question and this activation spreads out from the dog node through the network to other connected nodes. As it spreads, the

ACTIVITY BOX 14.6

The typicality effect

1 Write down the first five birds that come to mind.
2 Write down the first five mammals that come to mind.

Now look back at your lists, and ask yourself how many of the birds and mammals you've listed are untypical examples. For example, have you listed an emu as a bird or a bat as a mammal? Probably not.

activation becomes weaker with distance from the node until it has dissipated and can spread no further. Because dog and mammal are closely associated (short link) the mammal node will become activated strongly, enabling a quick, accurate response to the question. In contrast, if the question is 'is a bat a mammal?', then it will take longer to answer because the association between bat and mammal is weaker. Consequently, the link is longer so the activation has a long way to go and will only activate it weakly. It may even produce the wrong answer because some people don't know that bats are not mammals.

An important point about an associative network is that it is individual specific. It depends on the particular associations a person makes about how concepts are connected. Having said this, associative networks for common concepts are likely to be similar for most people.

The strongest evidence for the spreading activation model comes from experiments involving semantic priming. In a classic experiment, Meyer and Schvaneveldt (1971) found that participants' responses when presented with the word 'nurse' were quicker if the word 'nurse' had been preceded by the word 'doctor' than if it had been preceded by 'bus' or 'plumber'. Seeing the word 'doctor' activates the doctor node, from which activation spreads to the nurse node because they are strongly associated. The nurse node is thus primed, or partly activated, so that when the word 'nurse' comes along, the node is already 'prepared'. This would not happen if 'nurse' was preceded by 'plumber' because 'plumber' and 'nurse' are not associated.

Although a much used theory in the psychology of memory, the notion of an associative network has been criticised because it does not explain how the concepts are linked to their referents (what they refer to) in the real world.

Self-test: Describe a model of how concepts are related.

Attribute model of the nature of concepts

The attribute model is a different model, concerned mainly with the nature of concepts (Smith et al., 1974). Concepts such as 'dog' are represented by lists of attributes such as 'has four legs', 'has fur', 'has a pointy face', 'barks' and so on. The attributes are divided into defining attributes (four legs) and characteristic attributes (has a pointy face). So if we are asked whether a Labrador is a dog, we would simply compare the list of attributes for Labrador with the list for dog and make a decision on overlap between the two lists. The typicality effect is accounted for because the list for Pekinese would not overlap to the same extent (e.g. has a flat face, yaps rather than barks).

The major problem with such a feature list theory is that it's not clear what the defining features of a concept are. So a dog may not have a bark because of a genetic abnormality, but it's still a dog. It may have had one of its legs amputated, but it's still a dog. There seems to be no one feature that is critical for dogness.

Prototype model of the nature of concepts

Another type of knowledge representation theory is the prototype model. This follows on directly from the typicality effect because a concept is represented as an abstraction of characteristic features (Posner and Keele, 1970). The concept of 'dog', then, is represented as a prototypical dog, which is quite large, has four legs, a pointy face and is a pet. Labradors and Alsatians would fit the prototype well, but Pekinese and Chihuahuas wouldn't. The speed and accuracy with which a new instance would be classified as a dog would depend on how closely it fitted the prototype. Notice the potential for error. Wolves fit the prototype very well and it's only particular knowledge that blocks the classification of a wolf as a dog. Dogs are domestic, wolves are wild. This example highlights another feature of natural concepts, which is that they are 'fuzzy'.

The notion of prototypes and typicality also applies to other types of concept, such as the natural category of colour and the non-natural category of furniture. Much of this work was done by Eleanor Rosch in the 1970s, working across cultures to see if the structure of natural categories such as colour were universal and therefore, probably, innate. She argued that not all reds, for example, are equal – some reds are more representative of redness than others.

She worked with the Dani, a tribe with a colour vocabulary that distinguished only between light and dark. They had no individual words for colours such as red, blue and so on. Dani participants learnt the associations between names and colours better for prototypical reds than for other reds, suggesting that they too thought some reds better than others and that the distinction between the different types of red is based on perceptual rather than language differences. Rosch (1975a) also found typicality effect for semantic categories such as furniture. Chair and table were consistently rated as being more representative of furniture than bed or bookshelves (see Table 14.1).

Exemplar model of the nature of concepts

Some researchers (e.g. Brooks, 1978) have taken the notion of a prototype to an extreme and argued that all knowledge is episodic, not abstract. Concepts are represented as specific instances so that someone's concept of dog may be represented by, for example, their neighbour's black Labrador (see Brooks et al., 1991). This is known as the exemplar theory of concepts.

Self-test: Describe three models of how concepts are structured.

Schemata

Types of schema

While concepts are quite specific in what they refer to, schemata represent broader categories of knowledge. Bartlett (1932) introduced the notion of a schema in the context of cultural knowledge. He gave English students at

TABLE 14.1 TABLE OF REPRESENTATIVENESS OF FURNITURE (ROSCH 1975B): SOME ITEMS OF FURNITURE ARE RATED AS BEING MORE REPRESENTATIVE OF FURNITURE THAN OTHERS

Furniture category member	Goodness-of-example rank	Vehicle category member	Goodness-of-example rank
Chair	1.5	Automobile	1
Sofa	1.5	Station wagon	2
Couch	3.5	Truck	3
Table	3.5	Car	4
Easy chair	5	Bus	5.5
Dresser	6.5	Taxi	5.5
Rocking chair	6.5	Jeep	7
Coffee table	8	Ambulance	8
Rocker	9	Motorcycle	9
Love seat	10	Streetcar	10
Chest of drawers	11	Van	11
Desk	12	Honda	12
Bed	13	Cable car	13

Source: Rosch, 1975b

Cambridge (you might like to reflect on what their cultural background is likely to have been in 1932!) a story about Native Americans and supernatural events. When asked to recall the story, the participants consistently changed and distorted the story to make it consistent with English culture.

Another type of schema is called a script (Schank, 1982, 1986; Schank and Abelson, 1977) (see Activity box 14.8). As the name suggests, this is a schema that consists of a timetable of key events in common situations, such as going to restaurants, travelling to work and sitting an exam. Bower et al. (1979) asked participants to list what was involved in going to a restaurant and found that certain key events were listed by most of them: entering, giving the reservation name, ordering drinks, discussing the menu, talking, ordering dessert, paying and leaving a tip.

Notice that schemata such as scripts can also be discussed in terms of prototypes. The restaurant script produced by participants is actually a prototype for going to a restaurant. Some visits (e.g. to a French restaurant) will fit the prototype better than others (e.g. to a Japanese restaurant).

A third kind of schema is called a scene. Scene schemata are about the contents and layout of different places. Thus there are scenes for kitchens, chemistry labs, public houses and so on. Friedman (1979) presented participants with line drawings of different scenes (kitchen, office, farm, nursery) containing expected and unexpected objects. Participants spent up to twice as long looking at unexpected objects in a scene (e.g. a garden rake in the kitchen) than at expected objects (e.g. a saucepan in the kitchen). On a subsequent recognition test, changes to the unexpected objects (e.g. the rake replaced by a broom) were spotted more quickly than changes to the expected objects. This finding has been replicated many times (Henderson, 1992).

How schemata affect cognition

Earlier, we looked at an experiment that showed how schemata helped expert chess players remember meaningful

ACTIVITY BOX 14.7

Writing scripts

Write down all the things you usually do for these activities:

1. going to college for a lecture
2. going clubbing
3. writing an essay.

Even though there may be some variation from occasion to occasion, the kinds of things you do and the order in which you do them is likely to be fairly fixed for each of these activities. If this is the case then you have just written scripts for them.

chess positions. An experiment by Anderson and Pichert (1978) showed how schemata also affect retrieval. Participants were asked to read a description of a house from either a home buyer's or a burglar's point of view. They then recalled as much of the house as they could from the perspective they had adopted. Following this, they changed perspective (the burglar became a householder and vice versa). The participants in each group now produced information from their new perspective that they hadn't produced in their original recall. Adopting a new schema had helped them remember information more pertinent to that perspective.

Although schemata are clearly useful psychological constructs, they are open to the criticism that they are too imprecise to be of scientific value. For example, one type of schema is called a *story grammar*. Each type of story is alleged to have a clearly identifiable structure that most examples of that type follow (e.g. whodunnits, Mills & Boon romances). However, Harley (2001) has argued that, on closer inspection, there are as many story grammars as there are stories and a consensus on any particular grammar is hard to find. Eysenck and Keane (2005) argued that schemata are good at explaining results after they have been obtained but much less helpful at predicting them.

Self-test: What are schemata? How do they affect memory?

Summary

This chapter has provided an overview of memory. We have discussed, at various levels of detail, the major memory systems. We have tended to focus on short- and long-term verbal memory, partly because this reflects the literature and partly because our knowledge of this usually generalises to other systems.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Provide an overview of the different memory systems.
2. Assemble the evidence that distinguishes short-term from long-term memory.
3. Outline Atkinson and Shiffrin's (1968) modal model of memory and its major deficiencies.
4. Outline Baddeley and Hitch's (1974) working memory model.
5. Describe the major factors in encoding or learning information.
6. Describe the role of retrieval cues in remembering.
7. Describe the major theories of forgetting.
8. Distinguish between episodic, semantic and procedural memory.
9. Describe some features of autobiographical memory.
10. Distinguish between models of semantic memory.
11. Describe several types of schema.

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Cognitive psychology

15

Language

Route map

The purpose of this chapter is to introduce you to selected key topics in the psychology of language. It begins with a discussion of the design characteristics of language, which are then used to ask whether animals, particularly primates, can learn human language. The two sections after that deal with key ideas in sentence comprehension and sentence production. The chapter then moves on to a discussion of spoken word recognition before concluding with an examination of the processes involved in reading, the dual-route model and written word recognition.

Introduction

While the other cognitive abilities we have discussed in this section (memory, attention, perception and thinking) are general abilities that can be found in other animals, there is a powerful argument that language is a uniquely human ability. It is of enormous importance to our functioning and the advances humans have made. It is the basis of our knowledge and the transmission of this knowledge. It is the basis of our communication and its sophistication surpasses by some distance the communication systems possessed by other species. It is also the basis of much of our leisure, in the form of books, films and other media. It could be argued that it is one of the defining characteristics of being human.

One of the main proponents of this view has been the linguist Noam Chomsky (1957, 1965), who has argued that humans are innately endowed with language. We are born with a blueprint for language and the process of learning language consists of developing this blueprint into a grammar. The speed with which children learn language, without being taught it in any explicit way, is, Chomsky argues, strong evidence that it is innate. All a child needs is exposure to his/her particular language so that the grammar and vocabulary for that language can be developed (see the section in Chapter 19 on language development).

A crucial test of the hypothesis that language is innate and specific to humans is whether other animals have language. If they do use something comparable to human language to communicate, then we cannot claim it to be uniquely human. This would weaken the 'language is innate' hypothesis. If, by the same token, they have sophisticated communication systems but these are qualitatively different to human language, then the innate hypothesis remains plausible. In the first section of this chapter, we cover this issue in some detail.

Language and animal communication

Design features of language

All animals communicate, but do any of them have language? First, we must answer another question: 'What is language?' Rather than try to answer this with a disputable definition, psychologists and linguists have tried to identify the characteristics of human language.

The linguist Charles Hockett (1960) drew up a list of the design features of language. Many of these have been disputed but most researchers have been able to agree on a subset of between five and 10. The full list is presented in Table 15.1. Have a look at this table and then we'll discuss a subset that is particularly important to answering our question.

The first design feature of human language is **semanticity**. The words we use mean something. They stand for objects and actions in the world. Over time, they acquire associations with other objects and actions as well as emotional connotations. All of these are part of what we mean by the word 'language'.

A related feature is **arbitrariness**. Although words mean something, in themselves they are arbitrary symbols. Except for a few onomatopoeic words such as cuckoo and bang, which sound like the things they refer to, there is no connection between the symbol and its referent. For example, there is no reason why we call a dog a dog. Indeed, the French call it *un chien*. Other languages have different names. All have been chosen arbitrarily but they all have the same referent (the thing they refer to).

A third feature of human language is that of **duality of patterning**. This refers to the fact that combinations of arbitrary sounds are combined to form units (words) that mean something. Thus there is a duality to the structure of words – the sound level and the word level. Lest you think

TABLE 15.1	HOCKETT'S DESIGN FEATURES OF HUMAN LANGUAGE (RATHER THAN TRY TO DEFINE LANGUAGE, HOCKETT IDENTIFIED SEVERAL FEATURES HE CONSIDERED TO BE CHARACTERISTIC OF HUMAN LANGUAGE)
1	Vocal–auditory channel (communication occurs by the producer speaking and the receiver hearing)
2	Broadcast transmission and directional reception (a signal travels out in all directions from the speaker but can be localised in space by the hearer)
3	Rapid fading (once spoken, the signal disappears rapidly and is no longer available for inspection)
4	Interchangeability (adults can access everything about their productions)
5	Complete feedback (speakers can access everything about their productions)
6	Specialisation (the amount of energy in the signal is unimportant; a word means the same whether it is whispered or shouted)
7	Semanticity (signals mean something: they relate to the features of the world)
8	Arbitrariness (these symbols are abstract; except with a few onomatopoeic exceptions, they do not resemble what they stand for)
9	Discreteness (the vocabulary is made of discrete units)
10	Displacement (the communication system can be used to refer to things remote in time and space)
11	Openness (the ability to invent new messages)
12	Tradition (the language can be taught and learned)
13	Duality of patterning (only combinations of otherwise meaningless units are meaningful – this can be seen as applying both at the level of sounds and words, and words and sentences)
14	Prevarication (language provides us with the ability to lie and deceive)
15	Reflectiveness we can communicate about the communication system itself, just as this book is doing)
16	Learnability (the speaker of one language can learn another)
Source: Harley, 2001: 49	

this is a relatively trivial characteristic, consider the fact that a mere handful of sounds, such as /p/ and /b/ (between 20 and 30), can be combined to make hundreds of thousands of words. This is a characteristic that contributes to the creative power of language.

A fourth feature is structure dependence. This refers to the fact that language combines words in rule-governed ways to convey information. The same word order can mean different things (Jack chased Jill as opposed to Jill chased Jack). Different word orders can mean the same thing (Jill chased Jack as opposed to Jack was chased by Jill) The rules of combination vary from language to language.

A fifth feature is creativity. Although the sentences in a language have to conform to rules of structure, the number of combinations is infinite. There is no restriction on what we can say and still be understood. Whatever the message, we can find a combination of words to communicate it. You have probably never heard the sentence 'Aardvarks read Shakespeare regularly' but you still understand it, even if it is nonsense.

The features just mentioned have to do with the nature of language. There are other design features that have to do with the ways language is used. One of these is displacement, which is the use of language to refer to events in a different place at a different time. A history lecture is a good example of a communication with a displaced content.

Another feature is that of spontaneous usage. Language is not used only to respond to another communication or action. It is used freely to express thought and feelings that come from within the individual.

Finally, in this particular list, there is cultural transmission. This refers to the fact that language is passed between individuals and, particularly, between parents and offspring.

Self-test: What are the design features that potentially discriminate language from communication?

Do animals have language?

Jean Aitchison (1989), in her eminently readable book, *The Articulate Mammal*, tackles the question of whether animals have language by taking each of these features in turn and asking whether it is found in the communications of animals. Her logic is that if we take a given feature, such as cultural transmission, and find it in a species' communication, then it can't be a defining feature of human language. Using this strategy, she arrives at the conclusion that we can always find at least one species that has a particular design feature and some that have more than one. However, it is doubtful whether any species demonstrates displacement, duality, semanticity, structure dependence or creativity (see Activity box 15.1).

Can primates learn language?

Primates may be a different matter, however. There is over 40 years' worth of research on teaching human language to chimps and other primates. It quickly became obvious that it was pointless to try and teach them to speak because they don't have the vocal apparatus. Accordingly the various attempts to teach these animals language have used symbol systems such as deaf sign language and plastic tokens (called *lexigrams*) instead of spoken language.

The first attempt to teach language to a primate involved the chimp Washoe (Gardner and Gardner, 1969; see Figure 15.1), who was brought up as a child in the Gardners' house (this included toilet training!). She was taught American sign language (ASL). By the age of 4 Washoe could use about 85 signs and this grew to over 150 within the next few years. She showed some sensitivity to word order (structure dependence). For example, she distinguished between 'you tickle me' and 'I tickle you'. There was some evidence of creativity in that she signed 'water bird', a unique combination, to refer to a duck.

Another chimp, Nim Chimpsky (Terrace et al., 1979) (named, loosely, after the linguist Noam Chomsky), was able to combine two symbols quite regularly but longer combinations tended to be either repetitious or meaningless. Nim rarely signed spontaneously: over 90% of his signs were replies and 40% repetitions. Comparisons of chimps' language with that of an average 2-year-old child come out in the child's favour. Seidenberg and Pettito (1987) compared the performance of the more intelligent pygmy chimp Kanzi with that of a 3-year-old child and, again, found the chimp's performance inferior (see Table 15.2).

It's likely that even these achievements are exaggerated, because there are methodological problems with many of these studies. For example, there is plenty of scope for researcher bias (the tendency of researchers to interpret ambiguous data – unintentionally – in their favour). Pinker (1994) found that independent deaf human signers didn't understand many of the things Washoe signed. There's also the potential problem of selective reporting. Washoe's use of the creative combination 'water bird' seems, at first sight, to be good evidence of grammatical structure and creativity, but, as Harley (2001) points out, if this actually occurred in a stream of other signs such as 'water shoe', 'water food' etc., then its occurrence is far less impressive.

Most commentators on the status of chimp language conclude that the evidence for semanticity, as well as for

ACTIVITY BOX 15.1

Do animals have language?

[For individuals singly or in groups.]

The text lists a number of design features of human language: semanticity, arbitrariness, duality of patterning, structure dependence, creativity, displacement, spontaneous usage, cultural transmission. Now discuss, for each of the following creatures, those features they do possess and those they don't. Do they have language?

- A dog barking to indicate the presence of an intruder.
- A parrot that can mimic humans.
- A 2-year-old child.

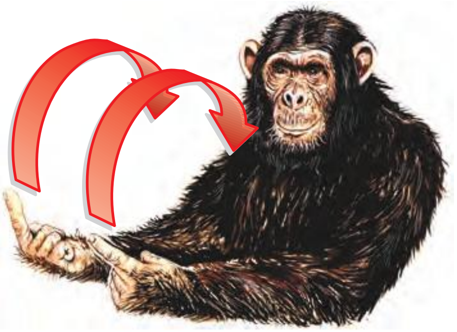

Figure 15.1 Washoe the chimp could use approximately 150 signs

structured and creative utterances, is flimsy and that, at best, the case for chimps having language is not proven.

Self-test: Is the symbol system primates learn equivalent to human language? Why?

Language (sentence) comprehension

Word order and constituents of sentences

The psychology of how we understand sentences and discourse is beyond the scope of an introductory text like this one. However, in this section we have selected some basic and quite robust findings that will give you a flavour of this fascinating but difficult topic.

The meaning of a sentence comes not just from the meaning of its individual words but also from the order in which those words appear. Thus 'Jack kissed Jill' does not mean the same as 'Jill kissed Jack' but *does* mean the same as 'Jill was kissed by Jack'.

Linguists such as Chomsky have provided strong arguments and robust evidence that the word order of English sentences is rule governed. Each speaker of a language has an internalised grammar or set of rules that enables the meaning of a sentence to be extracted from its word order. One of the principal aims of psycholinguistics is to identify the nature of these rules and how they generate the millions of sentences that are used every day and all the millions that they could generate. The term given to the rules of word order is syntax.

The importance of word order is that it tells the listener how the word meanings of a sentence are combined. So if you know, as you do, implicitly, the rules of English word order or syntax, then you know how to extract the meaning of a sentence from the meanings of the individual words. Consider the words in this sentence: 'The herd of elephants trampled the trees in the forest.'

by HAGEN
CAUTION TUNA NET
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Sometimes, I think that men imagine us smarter than we really are... What on earth does that mean?...

The words cluster together into constituents in a fairly obvious way and the cluster is related to the meaning. So a first step in deconstructing the sentence might be:

The herd of elephants trampled the trees in the forest.

This could be further broken down into:

The herd of elephants trampled the trees in the forest.

TABLE 15.2 A COMPARISON OF APES' AND CHILDREN'S LANGUAGE

Apes	Children
■ Mainly references to the here and now	■ Utterances can refer to other times
■ Lack of syntactic structure (rules of word order)	■ Clear syntactic structure and consistency
■ Need explicit training	■ Do not need explicit training
■ Rarely ask questions	■ Frequently ask questions
■ Little spontaneous use of symbols	■ Spontaneous use of symbols

Source: adapted from Harley, 2001: 56

And this into:

The herd of elephants trampled the trees in the forest.

The particular way in which a sentence breaks down to show how the words cluster together is called the phrase structure of the sentence. The process by which speakers of English derive the phrase structure of a sentence is called parsing. The question of how listeners parse a sentence is a major research topic in the psychology of language. One of the problems faced by a psychological parsing mechanism is that many sentences are ambiguous and can be parsed in different ways. So, for example, the sentence 'Flying planes can be dangerous' has two possible interpretations and therefore two possible parsings, as follows:

1. The act of flying planes can be dangerous.
2. Planes which fly can be dangerous.

Which is the correct interpretation can't be known without knowing the context in which it was spoken (e.g. by a test pilot or by someone who lives near a military training area). As we'll see shortly, however, ambiguous sentences also provide a window on how sentences are parsed.

Self-test: Why is word order important in English?

Psychological reality of constituents

A question of concern to psychologists (as opposed to linguists) is whether there is experimental evidence to show that listeners (and readers) actually break up sentences into constituents. The evidence is that they do. Jarvella (1971) read sentences to participants and these were interrupted at various points. When the interruption came, the participants had to write down as much of the sentence as they could remember verbatim (word for word). An example is: 'Having failed to disprove the charges Taylor was later fired by the president.'

Before moving on, break this sentence up into two parts at what you consider to be an appropriate boundary (i.e. the constituent boundary).

Now, if this sentence were being processed as a stream of words without any constituent structure we might expect the classic primacy-recency effect (see Chapter 14) with the first few words (having, failed, to) and the last few words (by, the, president) being remembered particularly well and the ones in the middle being remembered less well. What Jarvella (1971) actually found was that the whole of the second part of the sentence, 'Taylor was later fired by the president', was remembered very well. All the words were equally well remembered. The first part, 'Having failed to disprove the charges', was remembered much less well. In other words, the sentence had been broken down into two parts and this was reflected by the participants' memory. Did your division of the sentence coincide with the participants' division?

Other evidence of constituent structure comes from an experiment by Aaronson and Scarborough (1977) using reading. (It is assumed that the processes involved in parsing spoken and written language are generally the same. Converging results support this.) Participants sat in front of a screen on which the words of a sentence appeared one at a time. Participants controlled the appearance of each word by pressing a bar. This allowed the experimenters to measure how long a participant spent looking at each word and the length of the intervals between words. So, if the reader paused, this would show up as a lengthy gap between looking at two consecutive words. Look at Activity box 15.2 before you read on.

ACTIVITY BOX 15.2

Testing constituent structure

Here is one of the sentences that was used in Aaronson and Scarborough's (1977) experiment. Break it up into three parts.

Because of its lasting construction as well as its motor's power the boat was of high quality.

Now return to the text.

The results of the experiment for the sentence in Activity box 15.2 are shown in Figure 15.2, which plots the length of the intervals between words.

Notice first that the graph in Figure 15.2 is not a flat horizontal line, which would have resulted if the reader had been reading at a regular pace, as if to the beats of a metronome. Instead, the line is scalloped, with peaks and troughs. The peaks in the graph indicate where the reader paused. We can see from this that he or she paused between constituents. Do these constituent boundaries agree with the boundaries you identified in the sentence? They should be much the same.

Wrap-up

Both of the experiments just discussed show that sentence comprehension involves breaking the sentence down into constituents. They also suggest something else. The comprehension processes seem to 'wrap up' whatever they're doing at the constituent boundaries, hence the pauses. They seem to 'pack away' the results of a constituent before moving on to the next one. Wrap-up is also shown in another early experiment by Sachs (1967). She had subjects listen to text and then tested their memory for particular sentences in the text.

Test sentence: He sent a letter about it to Galileo, the great Italian scientist

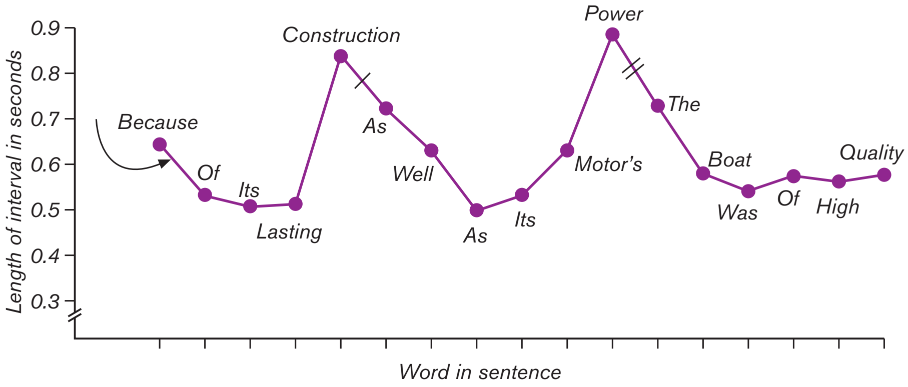


Figure 15.2 Pause time as a function of the position of a word in a sentence: pauses do not occur evenly across the sentence; the reader pauses at particular points
Source: J. R. Anderson, *Learning and Memory: An Integrated Approach*, © 1995. Reprinted with permission of John Wiley & Sons, Inc.

Sachs tested this by presenting subjects with a multiple-choice test of what they'd heard. In addition to the exact form of the sentence, they were also presented with one alternative in which the word order had been changed but the meaning was the same and another in which the meaning was different.

Multiple-choice alternatives to our test sentence can be given as follows:

- He sent a letter about it to Galileo, the great Italian scientist. (identical)
- He sent Galileo, the great Italian scientist, a letter about it. (word order changed)
- Galileo, the great Italian scientist, sent him a letter about it. (meaning changed)

The results showed that participants didn't pick up on word order changes, suggesting that their memory for the exact words and word order didn't last very long. Contrariwise, they were quick to reject alternatives in which the meaning was different. The conclusion is that listeners extract the meaning and pack it away, but discard the exact words and their order very quickly.

These experiments about the psychological reality of constituent structure seem to imply that the listener is waiting until she or he has heard all the words in a constituent before beginning work on the sentence. This is not the case. Further evidence suggests they begin working on the relationship between words (parsing) immediately – from the first word. This is called the immediacy principle (Just and Carpenter, 1980). You can test the psychological reality of the immediacy principle for yourself by reading the following sentence: 'The fireman told the man that he had risked his life for to install a fire detector.'

This is an example of a garden path sentence, so called because it leads the listener/reader up the garden path of interpretation. When you reach 'for' in the sentence there is a sudden realisation that you are on the wrong track and that you have to put together the first part of the sentence in a different way. Why does the sentence processor begin parsing immediately rather than adopting a wait-and-see policy? It would seem much more sensible to wait for a good chunk of speech before starting to put things together. If this were done, the garden path phenomenon would not exist.

The reason for this (according to Just and Carpenter, 1980) is that a wait-and-see policy would put a constant and burdensome strain on working memory. It's much more economical in cognitive terms to begin processing at once. Even though garden path sentences may cause a problem, in broad cognitive terms, they are an inconvenience worth suffering.

Self-test:

- What is meant by the constituent structure of a sentence? How does constituent structure affect sentence comprehension?
- What is wrap-up?
- What does the processing of a garden path sentence tell us about the nature of sentence processing?

Language production

A major problem with investigating language production is the difficulty of devising appropriate experiments. With language perception, we can manipulate variables such as the type of sentence and then look at the effects of this on comprehension. With production we can't stimulate the speaker into using different kinds of process. Consequently, language production relies more on naturalistic data such as speech errors, speech problems, and hesitations and pauses.

Levelt (1989) has identified three broad types of process involved in speech production: conceptualisation, formulation and articulation.

Conceptualisation processes operate at the thought level. It's not very clear exactly what's involved, but we can identify some aspects. Generally, the speaker has to work out what, in broad terms, she or he wants to say. The form of the message will be affected by its purpose, such as whether

TABLE 15.3 TARGET WORDS AND ERROR WORDS IN LEXICALISATION

Target (the word the speaker wants to use)	Error (the word the speaker actually uses)
Barely	Nearly
Today	Yesterday
Spade	Lawn mower

it's a question, a command or an assertion (Grice, 1975) and by the conversational context in which it is being delivered. Is it meant to persuade or merely inform? If it has factual content, then the level of detail and the order in which the information is presented need to be decided. Perhaps it includes some personal information. Generally, the message has to be linearised in that it has to be converted into a sequence of sentences. The defining feature of this initial level is that the product of the conceptualisation process is a preverbal message (Levelt, 1989).

The second main stage is that of formulation. The conceptual message has to be translated into a linguistic form ready to be spoken. This involves three main processes: appropriate words have to be selected; the appropriate word order has to be worked out; the component sounds of the words have to be specified. This can be thought of as a *blueprint* for the sounds.

The third stage is that of articulation. This takes the blueprint for the sounds and, through the use of the motor (muscular) processes involved, produces the correct sounds in the correct order.

We will deal with formulation in some detail.

Formulation

This section describes some of the processes involved in:

1. lexicalisation: selecting the appropriate words in terms of their meaning and phonology
2. syntactic planning: putting the words into the appropriate order
3. phonological specification: specifying the sounds of the utterance, and their order.

We'll deal with each of these in turn, looking at the types of speech error that occur at each stage.

Lexicalisation

Lexicalisation is the process by which a word meaning (animal, four legs, barks, man's best friend) is turned into a blueprint for the sound /dog/. Lexicalisation occurs in two stages. First, there is a process of lexical selection. The word that fits the desired meaning is selected from the mental lexicon (dictionary). At this point the word is in an abstract form and is called a lemma. The errors that occur at this stage are semantic errors (meaning based). The word that is wrongly selected is related in meaning to the target word. It could be a synonym (same meaning), an antonym (opposite meaning) or simply an associated word (see Table 15.3).

ACTIVITY BOX 15.3

The tip of the tongue (ToT) phenomenon

Brown and McNeill (1966) induced ToT experiences by presenting participants with definitions of infrequent words and asking them to produce the words. Here are two examples. See if you experience the ToT phenomenon.

1. What do we call a navigational instrument used in measuring angular distances, especially the altitude of the sun, moon and stars at sea?
2. What word means formally to renounce the throne?

Answers at the end of the section

TABLE 15.4 EXAMPLES OF MALAPROPISMS

Target	Error
Incubator	Incinerator
Antelope	Antidote
Equivalent	Equivocal

The second stage of lexicalisation deals with finding the correct phonological (sound) form of the lemma. This is a specification of the sound of the word in terms of its component sounds. Evidence for the existence of this stage comes, again, from speech errors. These occur because the wrong word is selected. The result is a malapropism. Malapropisms are speech errors named after a character called Mrs Malaprop in Sheridan's play *The Rivals*, who frequently used the wrong word. The distinguishing feature of a malapropism is that it sounds like the target word, particularly at the beginning. Some examples are given in Table 15.4.

Other evidence for the two-stage process of lexicalisation comes from the tip of the tongue phenomenon (Brown and McNeill, 1966). When someone is in the tip of the tongue state, he or she is unable to find the word they want. It's on the tip of their tongue. They have a very strong feeling of knowing what the word is, but can't quite find the spoken form. In lexicalisation terms, they have the correct lemma but can't find the phonological form. They are often able to say how many syllables it has and identify the sound it begins with. It's a transient experience, however, and the word usually pops into their head at some point soon afterwards (see Activity box 15.3).

Syntactic planning

The second major process in formulation is that of syntactic planning. Garrett (1975) distinguishes between two stages of syntactic planning: a functional stage and a positional stage. The functional stage is one at which the main functional components of the utterance are identified and assigned syntactic roles. In less technical terms, different parts of an utterance have specific roles, so in a simple sentence like 'Jack kissed Jill' there is a doer (the subject: Jack), an action (the verb: kissed) and the done-to (the object: Jill).

More complex sentences have other functional components such as describers (adjectives: big, blue etc.), determiners (a, the) and locational terms (prepositions: in, there, out). At the functional level, the relationship between these parts is specified in general terms but exact word order has not been determined.

Errors that occur at this level of planning are word exchanges. A very robust observation of speech errors is that 'like exchanges with like' so nouns exchange with nouns, verbs with verbs and so on. In particular, content words (names of things, names of actions) do not exchange with function words (the, in, from), they only exchange with other content words and vice versa. Here are some examples of exchange errors from this stage of planning.

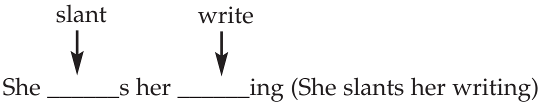
The Grand Canyon went to my sister

The red colour was attracted by the hummingbird of the feeder

Don't buy a car with its tail in the engine

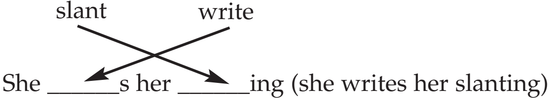
In the next stage, the positional level, word order is specified more precisely. At this stage, it seems that a sentence 'frame' is constructed. This frame is made up of the function words and word endings such as (-s and -ed). Content words are slotted into this frame. Errors occur when content words are put into the wrong positions.

Consider this sentence. What should have happened is this:



She ______s her ______ing (She slants her writing)

When this sentence was involved in a speech error what happened was this:



She ______s her ______ing (she writes her slanting)

These errors are called morphemic stranding errors, because the morphemes (the -s and the -ing) are stranded while their roots, the content words, exchange.

Here are some more examples of stranding errors.

That's why they sell cheaps drink (That's why they sell drinks cheap)

We have a lot of churches in our minister (We have a lot of ministers in our church)

Phonological specification

The third process in formulation is that of producing the phonological blueprint for the sounds of the sentence. Just like sentences are made up of component words, so words are made up of component phonemes. Within the formulation stage is a level at which the sounds of the words are constructed from component phonemes. Evidence from this stage of speech production comes from speech errors called spoonerisms. These are named after the Reverend Spooner (1844–1930), an Oxford don, who supposedly made large numbers of these errors. The characteristic of these errors is the exchange of speech sounds. Have a look at these examples.

You have hissed all my mystery lectures (You have missed all my history lectures)

You have tasted a whole worm (You have wasted a whole term)

jawfully loined (lawfully joined)

Photo 15.1 The Reverend Spooner.

Self-test:

- What are the three main processes in sentence production?
- Identify a speech error associated with each process of sentence production.

Spoken word recognition

Speech perception (see Chapter 12) is about how we perceive speech sounds and produce a percept. Speech recognition, by the same token, is about how we recognise a sound as being a word. As in written word recognition, this involves accessing the mental lexicon, the memory store that holds words and their meanings.

One critical difference between the written and spoken word is that the whole written word is available at the same time, whereas the spoken word 'arrives' over a period of time. Thus when we hear the spoken word 'trap' we hear the /t/ first, then the /r/, the /ae/ and, lastly, the /p/. This serial entry immediately raises the question of whether the speech recognition system waits for the whole word before beginning lexical search or whether it begins immediately on receipt of the first phoneme.

Marslen-Wilson (1975) had participants listen to spoken passages and repeat what they were hearing as it was being heard. This is called *shadowing* (see Research methods box 15.1). Some participants were particularly skilled at this. The message being heard contained errors such as omitted sounds, wrong sounds, grammatical errors and so on. Marslen-Wilson found that the shadowers were often correcting the errors spontaneously (they repeated the correct version of the word, not what they heard) and that this was being done before they'd even heard the whole word. The correction could only be made if they knew what the word was, so this means that they were recognising the word before they'd heard it all. He estimated from the lag time that they were recognising the word, on average, on the basis of the first 200 msecs (about the first syllable). This was confirmed using a technique called *gating*.

Grosjean (1980) presented a spoken word in segments: first the /t/, then /tr/ then /trae/ and then /traep/. The subjects tried to identify the word as early in this process as possible. He found that recognition was occurring after about 175/200 msecs, confirming Marslen-Wilson's estimate.

These results lead to the development of the cohort model (Marslen-Wilson, 1984, 1989). When the first phoneme enters the speech recognition system all possible words beginning with that phoneme are lined up as possible candidates. These candidates are known as the cohort. When the second phoneme comes, the number in the cohort is automatically reduced (there are fewer words beginning /tr/ than beginning /t/). There is further reduction when the third phoneme comes in. This continues until there is only one candidate left. This is the recognised word.

It seems a little difficult to believe that the number of candidates drops quickly enough to be useful, but Wayland et al. (1989) calculated that, on average, the number of candidates for concrete nouns drops to five after the first 300 milliseconds of the word. Marslen-Wilson (1989) has had to modify the model since 1984 but the essentials remain the same. Lexical access begins immediately.

Self-test: What does the cohort model tell us about how spoken words are recognised?

RESEARCH METHODS BOX 15.1

Shadowing and speech perception

The purpose of the shadowing task in this context is to examine online processes in speech production.

In contrast to the dichotic listening shadowing task, the participant hears only one message. She or he has to shadow this as closely as possible. The message contains errors of different kinds (omitted sounds, wrong sounds, incorrect grammar, and so on).

The variables of interest are:

1. whether the participant corrects errors
2. which errors they correct
3. the time frame in which they correct them.

The online correction of these errors tells the researcher about processes in speech perception (see the text for an example from Marslen-Wilson, 1975).

Written language

Reading words

Reading is an acquired skill. It is a relatively recent development in our cultural history and there are millions of people in the world who cannot read or write. This indicates that, unlike spoken language, reading and writing are not a hardwired product of evolution but are acquired through education.

English is an alphabetic language. The writing system (orthography) is built on a relationship between the component sounds of spoken words (phonemes) and the letters of the alphabet. Although English is notorious for its irregular spelling, in general the relationship between the phonemes (/p/, /ae/, /t/) and letters ([p], [a], [t]) is regular and predictable. The enormous advantage of an alphabetic writing system is that, once the relationship is learned, the user can read or spell any word, even those they haven't seen before. You should, for example, be able to read the following non-words: gand, spruck, lomted and voretin. The only constraint is that the sequence of sounds is permissible according to the rules of English word structure. You won't be able to read dnga, kprucs, tmoedl and tverio.

Dual-route model of reading out loud

The alphabetic basis of English orthography and the fact that there are many irregular words suggests that there are two ways in which we can read. The first is to make use of the regularity of English and read by converting spelling to sound. We call this the phonological (or indirect) route to reading. The second way is to use the visual characteristics of the word to look it up in the mental dictionary, which will also store its pronunciation. The word can then be read out loud. This is the visual (or direct) route to reading. Between them, the two routes can account for the reading of all English words. The dual-route model has been developed over the years, but this fundamental aspect of it remains (see Activity box 15.4; Figure 15.3).

To appreciate how the model accounts for reading all English words, consider Table 15.5. Words can vary along two dimensions: how well known they are, measured by how frequently they occur; and how regular they are. At one extreme on the frequency dimension, we have words like 'the' and 'and'. At the other end, we have non-words, letter strings that could be words but aren't. Examples are 'gond' and 'crift'. At one extreme of the regularity dimension, we have words like 'and' and 'milk', whose pronunciations are predictable from their spellings. At the other end, we have words like 'yacht' and 'colonel', whose pronunciations you have to be told.

The phonological route can only read words that conform to the rules of English spelling. So it will work for regular frequent and regular infrequent 'words' (and, milk, crift, gond). The direct route will only work for known words. They have to have been seen before and the pronunciation given. So it will work for frequent words (and, milk, said, people). Irregular infrequent words can't be read without previous instruction (myrrh, pyorrhoea).

The most powerful evidence for the dual-route model comes from neuropsychology and the acquired dyslexias (see Applications box 15.1).

Self-test:

- In the dual-route model of reading out loud, what kinds of word can the direct route handle? What kinds of words can the indirect route handle?
- How does the dual-route model of reading out loud explain the acquired dyslexias?

CLASS ACTIVITY BOX 15.1

Reading out loud: language

This exercise is designed for group work in seminars. It relies on the tutor being available to help and to discuss the purpose of the exercise and its implications.

1. Dual-route model of reading. Draw up a replica of Table 15.5 with the same headings. In each of the cells add to the words already there. So in the 'regular/frequent' cell k' with more words that are both frequent and regular. Repeat the process for the other three cells. Now answer the following questions (NB I am equating 'frequent' with 'known' and 'infrequent' with 'unknown'):
   1. Which route(s) can or can't read the regular frequent words?
   2. Which route(s) can or can't read the irregular frequent words?
   3. Which route(s) can or can't read the regular infrequent words?
   4. Which route(s) can or can't read the irregular infrequent words?
   5. Which words can an acquired surface dyslexic read? Which words can't s/he read?
   6. Which words can an acquired phonological dyslexic read? Which words can't s/he read?

answers at the end of the section

Word recognition

This section is concerned with how we recognise words visually and access their meaning. It focuses on the direct route in the dual-route model.

Effects of word frequency and context

Two tasks have been crucial to investigations of word recognition. The lexical decision task and the priming task (see Research methods box 15.2).

The lexical decision task presents the reader with a single word and asks him or her to decide, as quickly as possible, whether the word is an English word or a non-word. The

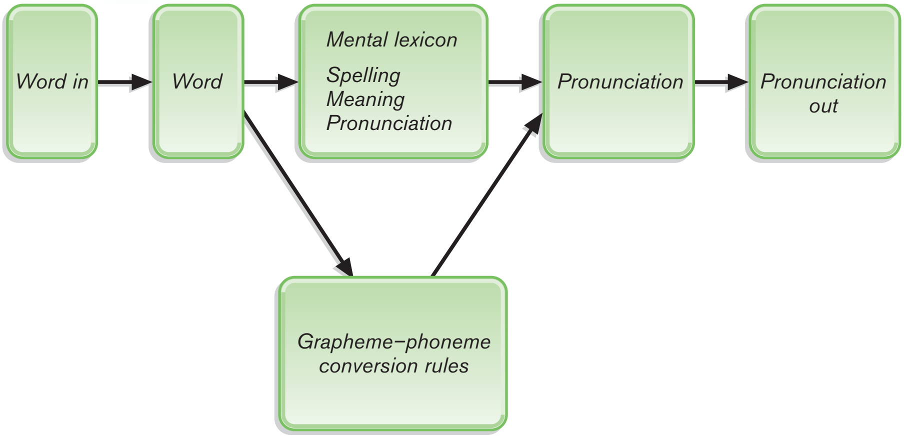


Figure 15.3 The dual-route model of reading: this argues that there are two routes to reading a word out loud (a direct route and an indirect route)

TABLE 15.5 EXAMPLES OF FOUR TYPES OF WORDS WHOSE READING HAS TO BE EXPLAINED BY THE DUAL-ROUTE MODEL

	Regular words	**Irregular words**
Frequent words	and, milk	said, people
Infrequent 'words'	crift, gond	myrrh, pyorrhoea

APPLICATIONS BOX 15.1

The acquired dyslexias

Acquired dyslexia refers to the general condition of someone who once knew how to read but who has lost this ability because of head injury. It's very important to distinguish acquired dyslexia from developmental dyslexia, which refers to people who have had difficulty learning to read in the first place. There are two kinds of acquired dyslexia relevant to this discussion.

Acquired surface dyslexia (Marshall and Newcombe, 1973) is characterised by severe impairment in the ability to read irregular words (yacht, colonel). Attempts at reading these words result in regularisation errors. That is, they are pronounced the way they are spelt, so 'yacht' would be pronounced 'yacked' and 'colonel' would be pronounced 'col-on-ell'. This is consistent with the loss of the direct or visual route to reading. The acquired surface dyslexic has damaged his or her direct route. They can read any word (and non-word) that is spelt regularly. This is consistent with the preservation of the indirect route and the ability to convert print to sound.

Acquired phonological dyslexia (Shallice and Warrington, 1975) is characterised by the loss of the ability to read regular non-words. If these dyslexics do not know the word they cannot read it, even if it is regular and potentially readable by conversion. This is consistent with loss of the indirect route. They can read any word they know, regardless of whether it's regular or irregular. This is consistent with the preservation of the direct route.

response time to different kinds of word under different conditions generates hypotheses about the nature of word recognition. The priming task primes recognition of the target word by presenting another word or sentence, or picture, before the target. So 'doctor' may be preceded by 'nurse' or by 'purse'. The response time to 'doctor' under these different conditions is the variable of interest (see Research methods box 15.3).

Many factors affect word recognition but principal among these is word frequency. The more frequent or common a word is, the quicker and more accurate the response (Whaley, 1978). Word frequencies are obtained from frequency norms such as that of Kucera and Francis (1967), which counts the number of times a word appears in a large sample of written texts. 'The' is the most frequent word in English. Response time in a lexical decision task is also

RESEARCH METHODS BOX 15.2

Lexical decision task

The purpose of the lexical decision task is to make the participant process a word (usually presented visually) to the point where its meaning may be accessed.

Participants are presented with real words (e.g. band) and plausible (pronounceable) non-words (e.g. gand), and asked to respond 'yes' to words and 'no' to non-words. Because the non-words conform to the rules of English spelling the only way this can be accomplished is by looking up the stimulus word in the mental dictionary, or lexicon. If it is in the mental lexicon it is a word. If not, then it is not a word.

The dependent variable is:

1 the time taken to respond
2 the number of errors made.

The effect of different variables, such as word frequency on processing a word, can thus be determined.

RESEARCH METHODS BOX 15.3

Semantic priming

The purpose of semantic priming is to discover the relationship between words (e.g. associative, categorical).

In a control condition, lexical decision times to a set of target words (e.g. doctor) presented on their own are determined. In the experimental condition the presentation of the target word is preceded by a priming word. This word is usually either related (e.g. nurse) or unrelated (e.g. purse) to the target. The most reliable effects occur if the participant is required to make a lexical decision on both the prime word and the target word.

The comparison of interest is the response time in the experimental condition relative to the response time in the control condition. If, relative to no prime, the prime speeds up the response to the target word, then it is said to be having a facilitating effect and the words are assumed to be positively related. If there is no difference between the prime and no-prime conditions, then the prime and target are thought to be unrelated. If the prime slows down the response then it is said to be having an inhibitory effect, and the target and prime are thought to be negatively related.

affected by the nature of the non-words. It takes longer to reject 'gand' as a word than 'gnda': 'gand' conforms to the rules of English word structure and needs to be checked out, whereas 'gnda' violates these rules and can be rejected without further checking.

Word recognition is also affected by priming. Meyer and Schvaneveldt (1971) showed that preceding a target word (doctor) with 'nurse' produced faster response times to doctor than when it was preceded by, say, 'purse'. Facilitation can also be obtained by preceding the target word with a sentence context if the word is a highly probable continuation of the sentence (Fischler and Bloom, 1979). For example:

For lunch he had roast beef and Yorkshire ______

Sentence context is particularly facilitatory if the word is difficult to read because of poor light, smudging etc. (Stanovich and West, 1981).

The logogen model

The logogen model (Morton, 1969; 1979) has been a very influential model of word recognition (as opposed to word perception). Every word is represented in a mental lexicon, or dictionary, by a logogen. This is a device that collects evidence that the word is present in the input. This evidence increases the activation of the logogen and, if it is strong enough, the activation rises above the logogen threshold and it fires. The word is recognised (see Figure 15.4).

For example, if 'book' is presented, then the logogens for 'boot', 'look', 'book', 'foot', 'boon' etc. will all accumulate some evidence because of the shared sounds. However, the most evidence is collected by the 'book' logogen and so it, rather than any of the others, will fire.

The threshold of a logogen is determined by the word's frequency. A high-frequency word will have a low threshold and so will be recognised more quickly than a low-frequency word with a high threshold. The level of activation is affected by the evidence collected from the input but also by the context. So the context 'For lunch he had roast beef and Yorkshire . . .' raises the activation of the 'pudding' logogen, making it quicker to recognise when it comes (see Figure 15.3).

Although the logogen model was later modified, the essentials of the model are seen most clearly in the older model. The logogen for a given word collects evidence from (1) the input and (2) the context until there is sufficient to trigger firing (recognition).

The early version of the model (Morton, 1969) had one logogen per word. It could be fired by either a visual (written) or auditory (spoken) input. However, Winnick and Daniels (1970) showed that priming the written 'book' by itself was more helpful than priming it with the spoken word 'book'. This should not happen if there is one logogen for both modalities. This and other evidence persuaded Morton to modify the model (Morton, 1979). In the new system, there are separate logogens for written and spoken versions of a word.

Self-test:

- What is the lexical decision task? What is it used for?
- What is the purpose of the semantic priming task?
- In the logogen model, how do priming and word frequency affect word recognition?

Summary

This chapter has dealt with the psychology of language. It began with a consideration of whether animals have language and, in so doing, addressed the question of the nature of language. It then went on to describe major processes in the comprehension and production of language. The psychology of spoken word recognition was then discussed, before the chapter ended with a discussion of the psychology of reading and word recognition.

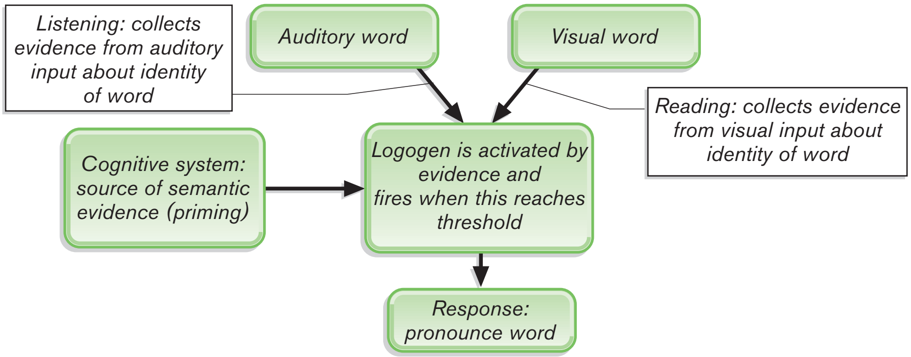

Listening: collects evidence from auditory input about identity of word
Auditory word
Visual word
Reading: collects evidence from visual input about identity of word
Cognitive system: source of semantic evidence (priming)
Logogen is activated by evidence and fires when this reaches threshold
Response: pronounce word

Figure 15.4 The logogen model (1969 version)

Learning outcomes

When you have completed this chapter, you should be able to:

1. Explain Hockett's design features of language.
2. Evaluate whether animals have language and whether primates can learn language.
3. Describe key aspects of how we understand sentences.
4. Describe some of the important aspects of sentence production, citing speech errors as evidence.
5. Describe the cohort model of spoken word recognition and supporting evidence.
6. Outline the dual-route model of reading and show how it explains acquired reading disorders.
7. Describe how the logogen model works.

Further reading

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2 Describe how (a) written words and (b) spoken words are thought to be identified. How are the processes similar and how different?

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Cognitive psychology

16

Thinking and reasoning

Route map

The aim of this chapter is to introduce the reader to important aspects of thinking and reasoning. It begins with a description of theories of problem solving and of the barriers to solving problems. It then deals with how we learn concepts and make judgements and decisions, all of which are rooted in inductive reasoning. The elements of deductive reasoning are identified before moving on to a discussion of how skills and expertise develop.

Introduction

According to Solso (1998: 420): ‘Thinking is the Crown Jewel of Cognition. It is spectacularly brilliant in some people . . . sublime amongst average folks; and the fact that it happens at all one of the great wonders of our species.’

Thinking, together with language, is what distinguishes us so clearly from other species. Look around you now and you’ll see the product of human thought: the written language you rely on for communication; the transport you use to get to and from college; the pharmaceutical and medical expertise you depend on when you’re ill. Although other animals can think, often in quite a sophisticated way, none of them comes close to the human capability.

Thinking is a broad term for many different activities, such as problem solving, decision making and reasoning, as we shall see in this chapter. The essence of thinking is the idea that it changes your view of some aspect of the world. You may start with the question ‘Which university should I go to?’ At this point your mental state is one of uncertainty. After thinking about it and making a decision your mental state is one of (greater) certainty. Your worldview has changed in one respect. When asked to write an essay your initial mental state is one of ignorance, but after doing the reading and thinking about it your mental state is one of organised knowledge. Again, your worldview has changed.

Here are three general characteristics of thinking. First, thinking is a collection of essentially private mental processes. We are aware that we are thinking and conscious of the products of thought but cannot describe, with any accuracy, the precise sequence of thoughts. Second, thinking involves knowledge. Often this is ‘only’ general knowledge about the world and how we think the world works, but sometimes it involves very specialised knowledge. For example, the thinking that goes on during a chess game involves specialist knowledge about the rules of chess.

Finally, thinking is usually directed towards some goal or end (but see Wetherick and Gilhooly, 1995, for work on undirected thinking). So thinking about how to get to work when the buses are on strike or trying to understand this chapter in preparation for an exam is thinking directed towards a specific goal.

Problem solving

According to Evans (1995: 61): ‘Problem solving consists of finding a method of getting from where you are to where you want to be.’ We could add that this excludes circumstances in which the solution is given to you through instruction or education and when it is not readily available through past experience. The sort of problem solving we do regularly includes anagrams and crosswords, trying to win at backgammon or chess, finding our way round a new area, making friends and trying to plan our careers.

An important distinction is that between well-defined problems and ill-defined problems. Anagrams and crosswords are examples of well-defined problems: you have all the information you need and know exactly what has to be done (doing it is the problem!). An ill-defined problem is one in which some aspect of the problem is not well defined. Most real-life problems are ill defined. You may not have the appropriate information (‘What do I have to do to become a clinical psychologist?’); you may not know which is the best strategy (‘Should I get practical experience before or after doing a degree?’); you may not even know what the goal is (‘Do I really want to be a clinical psychologist or do I want to be a counsellor?’).

Early theories of problem solving

The behaviourists (e.g. Hull, 1920) argued that problems are solved either by reproducing previously successful strategies and solutions or by trial and error. If your car won’t start on a cold morning you begin by working through all the past causes of this failure: damp wiring, battery low, old spark plugs etc. This is known as a reproductive strategy because it reproduces past solutions. If, however, none of these works you might resort to a trial and error strategy: poking and prodding, fiddling and fumbling, connecting and disconnecting and other random actions. After many trials and numerous errors, you might stumble across the solution, which would then join your repertoire of reproductive strategies for starting the car.

Trial and error explains some kinds of problem solving, as is illustrated in an early experiment by Thorndike (1911). He put hungry cats into cages that could only be opened if they hit a bar inside the cage. Food was put within sight outside the cage. After thrashing about frantically for some time the cats usually hit the bar accidentally and released themselves. On subsequent trials the time taken to hit the bar decreased dramatically until a point when the cats hit the bar immediately they were confined. It takes time for the correct association between pressing the bar and escaping to build up. Much animal learning is like this (see Chapter 8 on animal learning and cognition).

Gestalt theorists (such as Koffka, Kohler and Wertheimer) argued that problem solving was more of a productive strategy than trial and error suggested. New solutions were produced through insight, which is based on a reconfiguring, or restructuring, of the problem – seeing the problem in a different way.

Insight was demonstrated in a series of famous experiments by Wolfgang Kohler (1927) with apes, including one called Sultan. In one such experiment Sultan could only reach a banana outside his cage by joining together two sticks inside the cage. In another experiment, he could only reach food suspended from the ceiling by piling boxes on top of each other and then climbing on them to reach the banana. Although both problems could be solved by trial and error, Kohler observed periods of reflection by Sultan followed by an apparently insightful solution – the 'aha!' moment when the solution suddenly came to mind.

A problem with the Gestalt concepts of insight and restructuring is that they don't really explain what's going on in the ape's head when the problem is solved. Why does restructuring occur? What mental processes does it involve? Without answering these questions, insight and restructuring are little more than labels for particular aspects of the ape's behaviour.

Another problem is that Epstein (1984) subsequently showed that pigeons could solve the problem in the same way if they'd previously been trained to move a box to the correct location and climb on the box. This suggests that the ape's 'insight' could be attributed to previous relevant experiences and the building up of a chain of associations rather than a sudden restructuring of the problem.

Self-test: How, according to the Gestalt school of psychology, do we solve problems?

Barriers to success

The Gestaltists also identified barriers to successful problem solving. One of these is functional fixedness. This is the tendency to focus on the main function of an object and so not see that it could be used in other ways to help solve a problem. Duncker (1926, 1945) gave participants a candle, a box of nails, some matches and several other objects on a table. The task was to attach the candle to the wall beside the table so that when lit it didn't drip wax on the table. Duncker found that participants tried many things, including trying to nail the candle to the wall. Only a few thought of emptying the box of nails and tacking the box to the wall with the nails. It thus became a tray for the candle. Duncker argued that participants were so fixated on the box as a container of nails that they didn't see its potential use as a candle holder (see Activity box 16.1).

Another barrier to problem solving is mental set. People learn particular ways of doing things and continue to apply them even when they are clearly inappropriate. This is shown in another series of classic experiments involving water jugs (Luchins, 1942; Luchins and Luchins, 1959). The essence of these experiments is to get participants to learn the strategy for solving a set of problems and then show that they continue using the strategy even when it is clearly inappropriate for a new set of problems (see Table 16.1).

In each of the problems in Table 16.1, the aim is to transfer water from one place to another using three jugs. The amount to be transferred is given in column 5 of the table. The amount of water that the jugs can hold varies

Photo 16.1 Sultan solving the problem of the suspended banana.
Source: Kohler, 1927.

across problems (columns 2, 3 and 4 in the table). After solving a few of the problems the participants hit upon the solution, which is the same in each case:

1 fill pitcher B
2 fill pitcher A from pitcher B
3 fill pitcher C twice from pitcher B.

This leaves the required amount of water in pitcher B. The formula is pitcher B – pitcher A – twice pitcher C. This algorithm, or formula, applies to problems 1–6, but is wrong for 9 and is not the simplest solution to 7, 8, 10, 11. Nevertheless, participants persist in applying it because they have acquired a mental set that is difficult to abandon.

Functional fixedness and mental set are both examples of mental inflexibility. Past experience helps develop strategies that are enormously useful in solving the problems we usually come across, but can become a liability when a change in strategy is needed. It is difficult to break free of this. In sports such as football and tennis, for example, players develop tactics and strategies that work against most opponents. In football there is the long-ball game; in tennis, the serve-and-volley game. However, against an opponent whose style demands a change in tactics (a new solution), players often find themselves unable to change (e.g. play a passing game or set up baseline rallies).

ACTIVITY BOX 16.1

The pendulum problem

In the pendulum problem (see Figure 16.1), two pieces of string are suspended from the ceiling. The problem is to tie them together. However, the strings are not sufficiently long to allow you to grasp one and walk over to the other: if you're holding one piece of string you can't reach the other. On a table in the room are several objects: a glass of water, poles, a book and a pair of pliers. How can you tie the two pieces of string together?

When you've solved the problem, you might like to reflect on how you arrived at the solution. Did it just suddenly come to you? How long did it take you? Compare notes with other colleagues or with other groups.

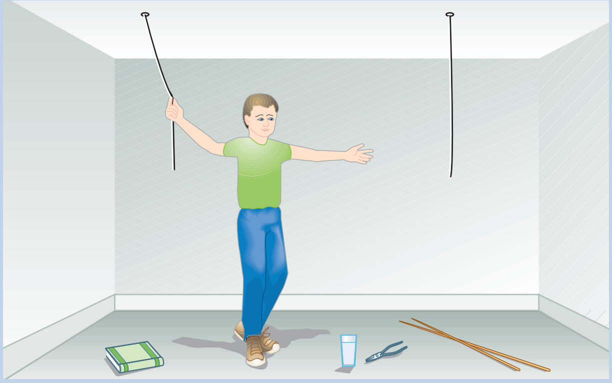


Figure 16.1 The pendulum problem
Source: Sternberg, 1996: 350

Answers at the end of the section

Self-test: What, according to the Gestalt school of psychology, are the barriers to problem solving?

Using analogies

Another strategy for solving problems is analogy. Experience plays a key part in analogical problem solving because the problem solver is trying to find a solution on the basis of the problem's similarity to another problem that he or she knows how to solve. However, this doesn't come as easily as one might suppose, as a study by Gick and Holyoak (1980, 1983) showed.

In this experiment the main problem to be solved is the radiation problem. Prior to this some participants are given a similar problem – the fortress problem – which they all solve. The question is whether solving the fortress problem helps them solve the radiation problem.

Here is the radiation problem. A person has a malignant tumour in the middle of his body (e.g. in the liver). The tumour can be removed by radiation therapy but the problem is that the radiation has to pass through healthy tissue to reach the tumour. A dose strong enough to kill the tumour will also kill healthy tissue. How can we destroy the tumour without also destroying healthy tissue? Only about 10% of Gick and Holyoak's participants solved the problem.

Now the fortress problem. A good king wants to attack a tyrant who is in his fortress. The good king has enough troops to ensure success but the problem is that the tyrant has laid mines along all the roads leading to his fortress. However, while the mines will be triggered by large numbers of troops, small numbers can pass over them safely. Accordingly, the good king divides his troops into small groups and each group approaches the castle along a different road. They don't detonate the mines and when they arrive at the fortress together there are enough of them to storm and destroy it (see Figure 16.2).

If you weren't able to solve the radiation problem before can you solve it now? The solution is to rotate the source of radiation through a full circle with the tumour at the focus. Thus, while the tumour receives a massive dose of continuous radiation no piece of surrounding healthy tissue receives more than a (safe) fraction of what is delivered (see Figure 16.3).

Gick and Holyoak (1983) found that 30% of participants who were given the fortress problem and its solution under the pretext of it being an experiment in memory (the 'no hint' group) subsequently solved the radiation problem. This is only 20% more than the group who had had no exposure to the fortress problem at all. So analogies are not spotted as spontaneously as one might expect. In contrast, 75% of a group whose members were exposed to the

TABLE 16.1 WATER JUG PROBLEMS USED BY LUCHINS (1942) TO DEMONSTRATE MENTAL SET; THE SAME ALGORITHM (B – A – 2C) APPLIES TO ALL PROBLEMS EXCEPT 9

	Containers given (capacity in quarts)			
Problem	*A*	*B*	*C*	*To get*
1	29	63	7	20 quarts
2	21	127	3	100 quarts
3	14	163	25	99 quarts
4	18	43	10	5 quarts
5	9	42	6	21 quarts
6	20	59	4	31 quarts
7	23	49	3	20 quarts
8	15	39	3	18 quarts
9	28	76	3	25 quarts
10	18	48	4	22 quarts
11	14	36	8	6 quarts

Source: Luchins and Luchins, 1950, in Medin and Ross, 1996: 493

fortress problem and who were told it would be helpful in solving the radiation problem (the 'hint' group) were successful. So giving hints about using analogy helps, but even with the hint the remaining 25% didn't get the solution. Again, it seems that analogies are not an obvious problem-solving strategy.

Self-test: Do people use analogies to solve problems?

The general problem solver

The most influential and complete model of problem solving was devised by Newell and Simon (1961). Their 'general problem solver' was developed to provide the basis for computer as well as human problem solving. They conceptualised solving a problem in terms of a number of states. The first of these is the initial state, which is a statement of the unsolved problem. This is followed by a number of intermediate states, each being a step on the path to the solution. Finally, there is the end state, which is when the problem is solved. The problem solver moves from state to state using an appropriate action (physical or mental) or operation. Appropriate operations lead to mental states that lead to the solution, while inappropriate operations lead to a cul-de-sac, which then has to be reversed. The solution depends on the problem solver finding a correct sequence of states (there may be more than one).

This description can be applied to a huge range of problems, such as finding the way through a maze, proving a theorem, solving an anagram, winning a game of chess, doing an experiment, finding the partner of your dreams or becoming prime minister! As it stands, however, it doesn't indicate how the problem is solved. How do we acquire the appropriate operations? How do we know which operations are appropriate? How do we know when to apply them? Generally, how does the problem solver move from the initial to the end state?

Previous experience and formal instruction play a role. In chess, for example, the moves (operations) that each piece can make are learnt, along with the rules of the game. Selection of the appropriate operations at any stage is governed by several considerations. One is to think through the alternatives to each move and their consequences. In chess, thinking two or three moves ahead for about two or three choices is the most that novices can manage. Newell and Simon (1961) argued that progress is governed by the use of heuristics. These are rules of thumb that guide a

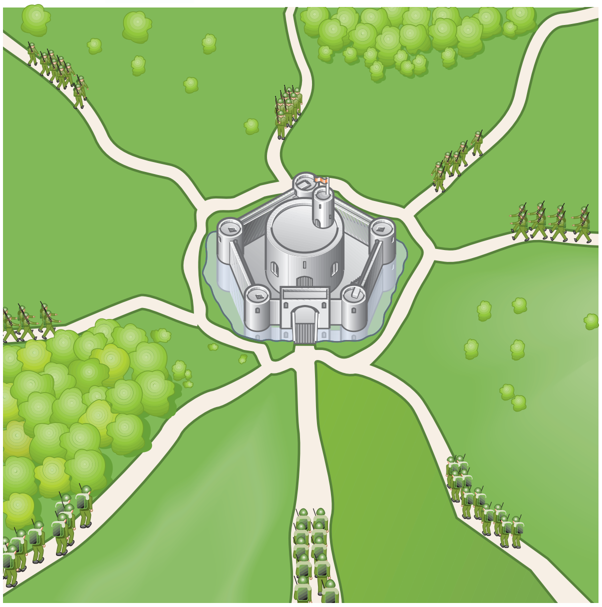


Figure 16.2 The fortress problem

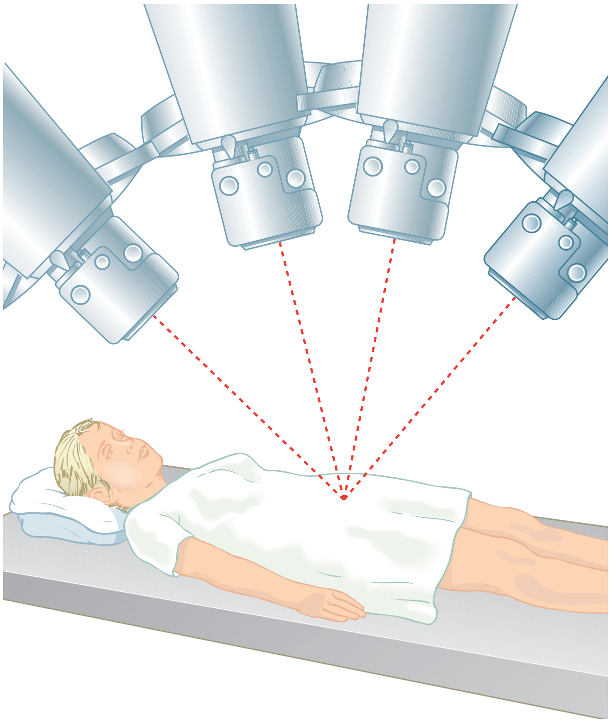


Figure 16.3 The radiation problem
Source: after Sternberg, 1996: 372

sequence of operations. They are imprecise and offer no guarantee of success. They stand in contrast to algorithms, which are sequences of precise rules that, if followed, will necessarily lead to a solution (see Activity box 16.2).

ACTIVITY BOX 16.2

Algorithms and heuristics

An algorithm is a problem-solving strategy consisting of a set of rules that, if followed precisely, leads to the correct solution. Think of examples of algorithms. Here are some to start:

- doing the Luchins (1942) water jug problems
- finding the area of a parallelogram
- finding a place from a set of precise directions.

A heuristic is a general principle that guides problem-solving. Think of examples of heuristics. Here are some to begin with:

- doing a jigsaw by putting together all the pieces with the same pattern (blue for the sky)
- trying to win a chess game by controlling the centre of the board
- finding a place by heading in its general direction.

After you or your group have thought of some examples, ask yourselves why the examples of algorithms aren't examples of heuristics and vice versa. This should help you understand the difference between the two.

A well-known heuristic is means–end analysis, in which the problem solver breaks the problem down into a series of subgoals. Subgoals represent milestones on the road to the solution and each becomes an end in itself. In chess, for example, an appropriate subgoal might be to protect the king and this might be achieved by 'castling' at the earliest possible moment. Other subgoals might be to control the main diagonals or to capture the opposition's queen. Subgoals break down the road to solution into more manageable chunks.

Self-test: How does a problem solver move from the initial to the end state in problem solving according to Newell and Simon?

Inductive reasoning

According to Anderson (1995: 323): 'Inductive reasoning is the term used to describe the processes by which one comes to conclusions that are probable rather than certain.' In this section, we cover several topics that deal with people's ability to draw conclusions from information that may not be complete or where several sources of information compete for attention. The conclusion is not something that follows inevitably from what we know. Inductive reasoning underpins the following sections on concept learning, judgement and decision making.

Concept learning

Concepts are mental representations of classes of object. Our concept of ‘table’ consists of all those things we consider to be tables. Our concept of ‘animal’ consists of all those things we consider to be animals and so on. Research into concept learning throws light on the inferential processes that underlie the acquisition of concepts. Sometimes these processes are explicit – the person is actively and consciously trying to learn the concept. At other times these processes are implicit – the person learns the concept without being able to say what it is!

An important distinction is between logical concepts and natural concepts. Logical concepts are identified by clear and unambiguous rules. For example, a square is a figure with four sides of equal length and where all the angles are 90°. Anything that fits these specifications is a square. Anything that doesn’t is not. In contrast, natural concepts, like ‘dog’, have fuzzy boundaries and can’t be identified on the basis of clear unambiguous rules. What are the ‘rules’ that distinguish a dog from a wolf (leaving aside specialised biological knowledge)? The different nature of logical and natural concepts may well influence how they are acquired.

While many concepts, such as those you’ve acquired through reading this book, are acquired through a process of education, most everyday concepts are not acquired through formal instruction. Children acquire a huge number of concepts, such as dog, chair, food, drink, car, clothes, in a very short time and largely on their own. So, how are concepts acquired?

Associative learning

The associationists (e.g. Hull, 1920) argued that concepts are acquired through a process of associative learning. The characteristics of chairs become associated with each other and with the word ‘chair’. To show this, Hull presented participants with Chinese characters such as those in Figure 16.4. In the first column of each row is a radical or specific character. This radical is present in the remaining characters in the row and defines the concept for that row. So in row 1 the radical in the first column is found in the characters presented in columns 2–7. These characters are therefore positive examples of the concept or category.

Each row of characters was mixed in with other Chinese characters that were not category members (they didn’t contain the radical) and participants were asked to classify each character in the mixed set as being a member of the category or not. Hull simply told them whether they were right or wrong. They learnt to categorise correctly, indicating that they had learnt the concept, but the process was gradual and took many trials. Even when successful, participants couldn’t state explicitly why a character belonged in one category rather than another. This pattern of responding is consistent with the building up of associations over a period of time.

Hypothesis testing

This account of concept acquisition was challenged by Bruner et al. (1956). They gave participants a similar task using complex stimuli such as those presented in Figure

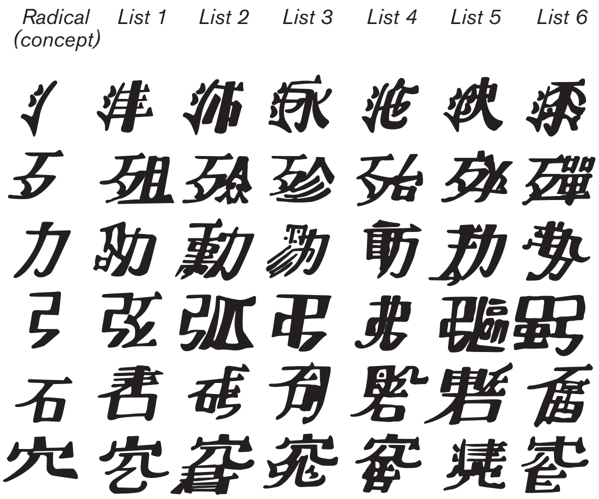
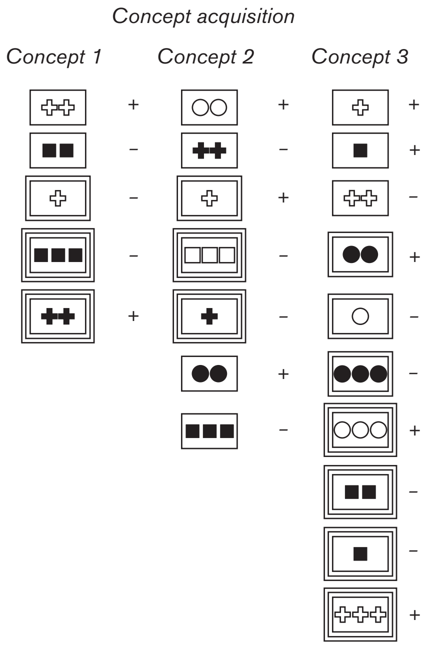


Figure 16.4 Chinese characters used in Hull’s concept learning experiment: the character in the first column is found in all the remaining columns for that row – it defines the concept
Source: Anderson, 1995b: 352



Concept formation has been studied in paradigms in which subjects see instances identified as members or non-members of a concept they are supposed to identify

Figure 16.5 Some stimuli used in Bruner, Goodnow and Austin’s (1956) concept learning experiment. Each column has both positive (1) and negative (2) instances of a concept
Source: Found in Anderson, p355

16.5. The task for the participants was to determine the basis on which cards would be classified as being positive or negative instances. In column 1, any card with ‘two crosses’ is a positive instance; all others are negative instances. In column 2, any card with either ‘two circles or two borders’ is a positive instance and all others are negative. In column 3, any card with ‘equal number of borders and objects’ is positive and all others negative.

Note that in these cases a logical concept, or rule, for categorisation is involved. There is a clear classification rule. Bruner et al. (1956) found that participants were forming hypotheses about the nature of the concept. After a few patterns, they would speculate about the rule for classification and classify subsequent patterns on the basis of this rule. However, if the rule was wrong and they made an error, they would abandon the rule and speculate on a new one. This would continue until they got the rule (see Research methods box 16.1).

Bower and Trabasso (1963) followed up on this and looked at each participant’s performance. They found that until the participant got the correct rule she or he was performing at chance level. Immediately they got the rule, however, they jumped to 100% correct. This sudden change in correctness is difficult to explain as a gradual build-up of associations.

Confirmation bias

A very strong factor in hypothesis formation is the phenomenon of confirmation bias. This is the tendency to look only for evidence that confirms the hypothesis and to neglect evidence that the hypothesis is wrong. The problem with doing this is that no matter how much confirming evidence, we find we can never be certain that the hypothesis is correct. There is always the possibility that a counterexample exists. Finding countless birds that fly supports the hypothesis that ‘all birds fly’ but it doesn’t prove it, because there is always the possibility of coming across birds that don’t fly. Instead we should look for evidence that disconfirms, or refutes, the hypothesis. We should be looking for birds that *don’t* fly.

If the hypothesis survives this test, then the probability that we have the right hypothesis is increased significantly. If it doesn’t, then we must change the hypothesis. Immediately we came across penguins or kiwis, we would have to amend the hypothesis to ‘most birds fly’.

Confirmation bias was well illustrated in an experiment by Wason (1960). He provided participants with a set of three numbers: 2, 4, 6. Their task was to find the rule that had generated these numbers. The participants did this by generating new triples of numbers and the experimenter telling them whether each triple conformed to the rule or not. When the participant felt confident that he or she had found the rule they had to report it and were told whether or not they were right.

Participants tended to generate numbers that increase in twos (1, 3, 5; 33, 35, 37; 102, 104, 106) and were then surprised to find that the rule is not ‘numbers that increase in twos’. They continued to generate triples that increase in twos. The rule, decided by the experimenter, was actually ‘three increasing numbers’ and the best way to get to this is to generate sequences that refute the ‘increases by twos’ rule (i.e. they should produce a sequence such as 2, 4, 5).

RESEARCH METHODS BOX 16.1

The reception and selection paradigms for testing concept acquisition

This Research methods box looks at Bruner, Goodnow and Austin’s (1956) reception paradigm of concept learning and selection paradigm of concept learning.

AIM: the aim of the experiment is to learn how participants acquire concepts.

Reception paradigm

METHOD: the participant is presented with a series of cards, one at a time. Some cards contain positive examples of the concept, the remainder do not; the participant is asked to respond ‘Yes’ (card is an example of the concept) or ‘No’ (card is not an example of the concept) to each card presented.

DEPENDENT VARIABLE: the experimenters are interested in the sequence of responses; this tells them about the kinds of strategies the participant is using and the hypotheses the participant is testing.

EXAMPLES OF RESULTS: Bruner et al. (1956) identified a wholist strategy, used by most participants, in which participants tried to recall the characteristics of all the positive instances they could remember and formulate an appropriate hypothesis; this clearly imposes a big memory load but can produce a quick result.

Selection paradigm

METHOD: the participant is presented with all the cards; his/her task is to select a card, one at a time, which she or he thinks is an example of the concept; he or she continues to select cards until he or she has acquired the concept.

DEPENDENT VARIABLE: the experimenters are interested in the sequence of responses; this tells them about the kinds of strategies the participant is using and the hypotheses the participant is testing.

EXAMPLES OF RESULTS: with a conservative focusing strategy the participant picked one positive card and then systematically changed one attribute at a time to find out which were relevant; with a focus gambling strategy the participant picked one positive card and then changed several attributes at a time in the hope they would strike lucky.

They would then have to come up with another hypothesis. This is the most efficient strategy in the long run.

Resolution

Anderson (1995) argues that trying to find a single theory for how concepts are learned may not be very sensible. The type of learning that occurs may be a function of the kind of concept that has to be learned. The Bruner et al. (1956) patterns are rule governed and so are conducive to a hypothesis-formation strategy that people will, very sensibly, adopt.

By way of contrast, natural concepts are fuzzy. Some examples of the concept are more typical than others and they don't have defining features. The concept 'dog', as we have seen elsewhere, depends on possessing a cluster of features (four legs, barks, man's best friend etc.) and there is no unambiguous rule that distinguishes dogs from wolves, jackals, hyenas and the like. Anderson argues that association learning may well be how natural concepts such as 'dog' are acquired.

Self-test:

- How do the associative learning and hypothesis testing views of learning concepts differ?
- What is meant by confirmation bias?

Judgement

Judgements involve drawing a conclusion from a combination of knowledge and observation. We make judgements all the time:

Q1 Is this person I've met someone I can trust to look after my bag?
A1 Yes, I think so. He's got an honest face and plays cricket.
Q2 Am I likely to get mugged if I visit my friend in central London?
A2 Almost certainly. Someone got mugged there last week.
Q3 Are Londoners more intelligent than other people?
A3 Probably. People from other places are always asking for directions. Besides, I'm from London.

In each case, we make a judgement about the answer and, in each case, the answer takes the form of a subjective probability. These examples show that subjective judgements are often based on partial or incorrect information, flawed reasoning and prejudices.

Base rate information

In some cases when we are called on to make probabilistic judgements, objective data are available to us. We know, or are told, how likely some events are and our judgements should be based on this objective information. An interesting question asked by researchers has been, 'Do people use this base rate information when making judgements?' A number of experiments have examined this question (e.g. Casscells et al., 1978; Cosmides and Tooby, 1996). See Activity box 16.3 for a much cited example from the pioneers in this field.

ACTIVITY BOX 16.3

Judgement and base rate information 1

Problem 1

Of a sample of 100 people, 30 are engineers and 70 are lawyers. I select, completely at random, one person from the sample. What are the chances that he is an engineer?

Proceed to Activity box 16.4.

Kahneman and Tversky (1973) gave the problem in Activity box 16.3 to two groups of participants. Members of group A were told that of the sample of 100 people, 30 were engineers and 70 were lawyers; those in group B were told that 70 were engineers and 30 were lawyers. Both groups gave the correct answer. Group A said 30% and group B said 70%. They were both perfectly capable of understanding and using objective base rate information about the relative incidence of engineers and lawyers in the sample. The two groups were then given the problem shown in Activity box 16.4.

This time, both groups said that Jack was almost certainly an engineer (90% certain). Both groups were ignoring base rate information. The effect was particularly marked in group B. Members of this group knew that only one in three men in the sample was an engineer but were still prepared to say that Jack, chosen randomly, was almost certainly an

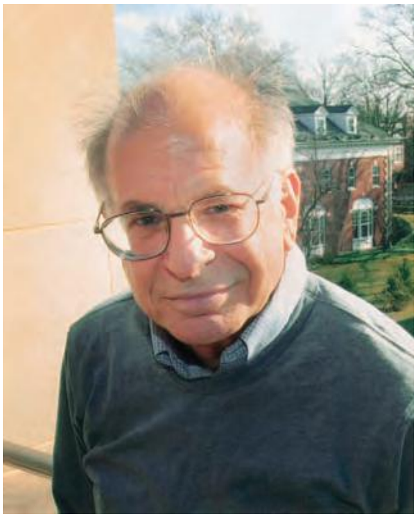


Photo 16.2 Daniel Kahneman, Nobel Laureate (2002) for having integrated insights from psychological research into economic science, especially concerning human judgement and decision-making under uncertainty.

ACTIVITY BOX 16.4

Judgement and base rate information 2

Problem 2

As before, of a sample of 100 people 30 are engineers and 70 are lawyers. One person is selected from the sample. This time we have a bit more information about him:

Jack is a 45-year-old man. He is married and has four children. He is generally conservative, careful and ambitious. He shows no interest in political and social issues and spends most of his free time on his many hobbies, which include home carpentry, sailing and mathematical puzzles.

What are the chances that Jack is an engineer?

Did you get the same answer as you did in Activity box 16.3? If it's different, why do you think this is so? Do you actually agree with the answer given in the text or do you think you're answer is right? Why?

engineer. This and other experiments show that we are not very good at using base rate information.

Heuristics

Why did these participants become distracted from the base rate information? Kahneman and Tversky (1973) argued that participants use heuristics (rules of thumb) rather than logical thinking or an objective calculation of probabilities because this is less difficult and demanding. In this particular example they used the representativeness heuristic. In making their judgement, they concluded that the description of Jack was more representative of an engineer than a lawyer. It fitted their stereotype of an engineer. The representativeness heuristic says that we base our judgement more on our subjective impression of how representative an instance is of a particular category than on objective information.

Tversky and Kahneman (1974) also found that people make likelihood judgements using the availability heuristic. In this case, the estimate is made on the basis of relevant memories. To illustrate, if people have just seen a television series about street crime they are more likely to feel vulnerable than if they haven't seen the series because examples of street crime are fresher in their memories.

The availability heuristic is about making judgements based on the relative availability of relevant memories. The effects of the availability heuristic have been demonstrated in medical decision making. Doctors, like everyone else, seem to be very influenced by recent events. They are more likely to make a diagnosis of, say, heart disease if they have recently seen and diagnosed several cases of heart disease (Weber et al., 1993). The base rate information about the likelihood of heart disease would tend to be swamped by these experiences and so have much less influence on his/her judgement.

Finally, an interesting source of miscalculation in arriving at probabilistic judgements is gambler's fallacy, also known as the 'law of averages'. This is the belief that if an event (red coming up on a roulette wheel) has not happened for a while then it must come up soon 'because of the law of averages'. In fact, each spin of the roulette wheel is independent and whether red or black comes up is completely unrelated to what has happened previously. Casinos love gamblers who believe this because they bet on 'runs'. Gambler's fallacy is another example of how baseline information (e.g. the objective probability of red or black coming up on a turn of the roulette wheel) is distorted in the implicit calculation of the subjective probability (see Activity box 16.5).

Self-test:

- What crucial information do we seem to ignore in making probabilistic judgements?
- How do we seem to make probabilistic judgements?

Decision making

How do people make decisions? What affects the choices we make? Are our decisions logical? The starting point for research on decision making is the assumption that people calculate the expected utility of each of the alternatives and then pick the best one (von Neumann and Morgenstern, 1947). Expected utility is calculated by multiplying the value of an alternative ('How much money will this bring me?', 'How happy will it make me?') by the probability or likelihood of it happening (very unlikely, quite likely and so on) (see Activity box 16.5).

In both examples in Activity box 16.5, expected utility theory says that in both cases you make your decision by multiplying the value of each alternative (the money, the attractiveness of the person) by the probability of attaining it (more or less likely).

Biases in decision making

A factor that affects the decisions we make is called loss aversion. A choice that entails a loss counts more than it should according to loss aversion. Kahneman and Tversky (1984) gave participants the chance to toss a coin and win \$10 if it came up heads or lose \$10 if it came up tails. Most people declined the invitation even though the chances of winning and losing are equal. They were averse to losing. The aversion to losing continued even when they were promised \$20 if it came up heads because of the fear of losing \$10 if it came up tails! Loss aversion is part of our everyday lives. Have you ever decided to stay with the partner you currently have, even though she or he is a bit dull and even though you may have been able to find someone more lively? If so, perhaps it's because you were averse to a certain loss in the hope of a possible gain.

A factor related to loss aversion is the sunk cost effect (e.g. Dawes, 1988). This is also known as 'throwing good money after bad'. Suppose you have just bought a car that

CLASS ACTIVITY BOX 16.1

Thinking and reasoning

[These exercises are designed for group work in seminars. They rely on the tutor being available to help and to discuss the purpose of the exercise and its implications.]

The aims of the activities below are to help you develop (1) an understanding of key topics in this area and (2) your expertise in simple experimental design. In each case you are asked to design a simple experiment. Try and restrict your design to *one* independent variable and keep the number of levels to two or three. You may consult your lectures notes or any other information you have to hand.

1. Problem solving. You are a researcher looking into the effects of practice on the acquisition of strategies in problem solving. Outline an experiment to find out if practice with simple versions of Soduku help solve more complex versions:
    1. Name the independent variable.
    2. Identify the levels of the independent variable.
    3. Identify your dependent variable and how it will be measured.
    4. State briefly what you would expect to find and draw a hypothetical graph to illustrate.
    5. Explain the reasons for your hypothesis.
2. Judgement. The government is worried that people's perception of crime is very volatile and changeable. They have hired you to find out if recent exposure to reports of crime in an area affect judgements about the likelihood of being a victim in that area:
    1. Outline an experiment to answer the question.
    2. Name the independent variable.
    3. Identify the levels of the independent variable.
    4. Identify your dependent variable and how it will be measured.
    5. State briefly what you would expect to find and draw a hypothetical graph to illustrate.
    6. Explain the reasons for your hypothesis.

answers at the end of the section

turns out to be a dud. The repair bills keep coming in and all the indications are that this will continue. Should you keep the car or get rid of it? One factor that affects your decision is the amount you've already spent. If you got rid of the car, you would be throwing this away. This is a sunk cost and it makes you reluctant to get rid of the car in spite of the prospect of more bills.

ACTIVITY BOX 16.5

Calculating expected utilities

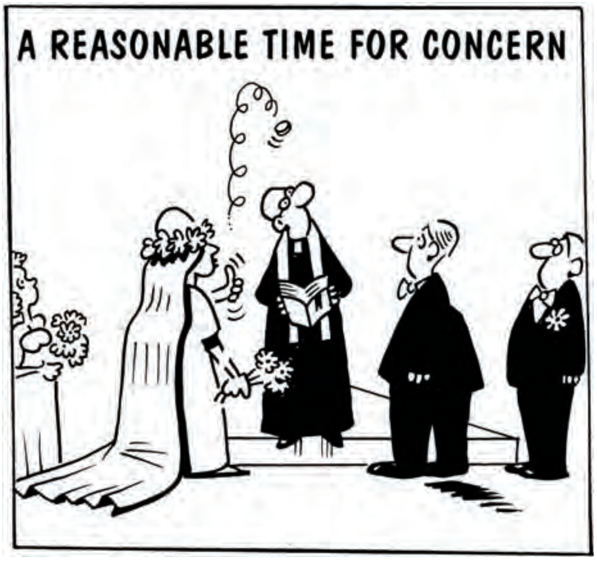
Situation 1

You have a pound to spend on the lottery. You have two choices. You can spend it on a lottery that has one prize of £10 million or on another that offers 100 prizes of £100,000 (i.e. the same total money). Which do you go for? How have you made your decision?

Situation 2

You are at a party. You see two people you find attractive. One is mildly attractive and has been sending you signals that they find you attractive. The second is stunningly attractive and gave you a brief smile when you first came into the room. Whom should you approach with the intention of getting a date?

When you or your group have finished this activity, reflect on why you made the choice you did. Was it difficult to make?


A REASONABLE TIME FOR CONCERN

Making a difficult decision

Another example is deciding how long to wait on the phone when you have been put on hold. The longer you wait the more difficult it becomes to hang up because of the time and money you've already sunk into waiting.

Self-test: Identify some of the biases in decision making.

Deductive reasoning

Deductive reasoning is concerned with the ways in which we deduce the conclusion(s) that follow from premises (bits of information we are given initially). In theory this should be a simple matter of following the rules of logic. In practice, human beings deviate quite considerably from the rules of logic. Research into deductive reasoning takes the form of presenting participants with premises and then asking them for the conclusion. Their errors and deviations from logic inform us about how they are reasoning. For example, suppose you are told the following:

1 If Jim understands this section of this chapter he will get a good exam mark.
2 Jim understands this section of the chapter.

According to the rules of logic, the valid conclusion must be that Jim will get a good exam mark.

As Anderson (1995) points out, this example illustrates the problems of applying logic to the real world and using it as an idealised model of thought. Psychologically, we all know that many other things will also determine the kind of mark Jim gets, but logically we must conclude that he will get a good mark.

Skill and expertise

Skill

As we have seen, thinking involves solving some sort of problem. The discussion so far has dealt largely with what happens when we encounter a problem for the first time. However, it's clear that we all become skilled at solving the everyday problems we encounter. We learn to read, get on with people, look after ourselves, play games, write essays and pass exams, do a variety of jobs and so on. Each of these was a problem at one time. How does initially effortful, error-prone problem solving turn into the acquisition of skills that facilitate competent or even expert performance?

Anderson's theory of skill acquisition

According to John Anderson (e.g. 1995) skills are acquired in three stages: a cognitive stage, a procedural stage and an autonomous stage. The concept 'skill' applies to: speaking one's native language, reading, maths, interacting with other people, driving a car. We have specific terms for people with skills in particular domains: physicists, doctors, carpenters, counsellors, computer programmers, pianists and lifestyle gurus.

In the initial cognitive stage of skill acquisition the task is one of problem solving. It is the state in which we:

1 Identify the nature of the problem.
2 Learn or are taught the operations or actions needed to solve the problem.
3 Apply the appropriate heuristics or algorithms.
4 Solve the problem.

All this is conscious and reflective. It is usually hard work and often frustrating. Anderson says that the knowledge involved at this stage is declarative knowledge. We can describe what we know and what we are trying to do with this knowledge.

Consider two seemingly different examples. First, driving a car for the first few lessons. We can describe:

- how to start it
- how to make it move forwards
- how to steer it
- how to stop it.

Our description will involve terms such as clutch, steering wheel, accelerator, brakes and so on. We can also perform all the necessary actions, even though our performance may be somewhat clumsy and error prone. We have to remind ourselves of the sequence or ask our instructor and we're more or less oblivious to other road users, the route we're taking and the Highway Code.

Consider another example: learning to read. The early stages involve learning the letters of the alphabet, learning the relationship between sounds and letters and learning to translate the letters in a word into a sequence of sounds. Again, this is declarative knowledge that can be articulated by the novice reader.

Next there is the procedural stage of skill acquisition, in which this declarative knowledge becomes procedural knowledge. What we know becomes a set of procedures. Procedural knowledge consists of 'production rules', which have an 'if . . . then . . .' form. The 'if' specifies when the rule is to be applied and the 'then' specifies what has to be done.

Here are some simple production rules for changing gear in a car:

- If I want to change gear, then I need to lift my foot off the accelerator.
- If I want to change gear, then I need to depress the clutch.
- If I want to change gear, then I need to move the gearstick.
- If I want to change gear, then I need to release the clutch.
- If I want to change gear, then I need to press the accelerator.

Here are some production rules for reading:

- If I want to read this word, then I must break it up into its component letters.
- If I want to read this word, then I must find the correct sound for each letter.
- If I want to read this word, then I must pronounce each letter.
- If I want to read this word, then I must blend the sounds together.

In both cases, experience and practice make the associations between the 'if' part (the situation) and the 'then' part (the action) stronger. It's also evident from these examples that the set of production rules that make up a complex action need to become coordinated. Sequence and timing are crucial. We are all familiar with trying to move the gearstick before depressing the clutch (resulting in a harsh grating sound) or letting the clutch out and failing to press the accelerator (the car stalls). The end result of this associative stage is a reasonable ability to perform the sequence of actions, but it stills takes concentration and mental effort.

Finally, there is the autonomous stage of skill acquisition. In this stage, the skill develops to the point where it doesn't need thought or even attention. The sequence of production rules is triggered and implemented rapidly in a smooth sequence. The sequence of actions becomes automatic (these are known as automatic actions in skill acquisition). The different components become 'welded' together, a consequence of which is that it becomes difficult to interrupt the sequence (see Figure 16.6). It also becomes possible to do something else at the same time without any obvious detriment to performance. Consider the fact that skilled drivers can hold conversations at the same time as driving. This is not true of the prudent novice.

The Stroop effect

A striking example of the automaticity of skilled performance comes from reading and the Stroop effect. Complete the activity in Activity box 16.6 before reading on.

You should have found naming the ink colours of words in column 1 much more difficult than naming those in column 2. This is because you can't avoid reading the words and the fact that they are colour names interferes with naming the ink colour (i.e. reading is automatic). (If you want to do an online Stroop experiment go to http://epsych.msstate.edu/deliberate/index.html.)

Self-test:

- What, according to Anderson, are the stages of skill acquisition?
- What does the Stroop effect tell us about human information processing?

Expertise

While almost everyone acquires a range of everyday skills, and some people some quite unusual ones, only a few people become experts in their chosen field. A little reflection will reveal that expertise is a 'fuzzy' concept. At what point does a good chess player, a good carpenter or a good doctor become an expert? Experts seem to have two major characteristics. First, they have a huge fund of declarative knowledge about their field of expertise; chess masters can recall in detail scores of games played by themselves and others. Second, experts can also solve problems that those with less skill can't solve.

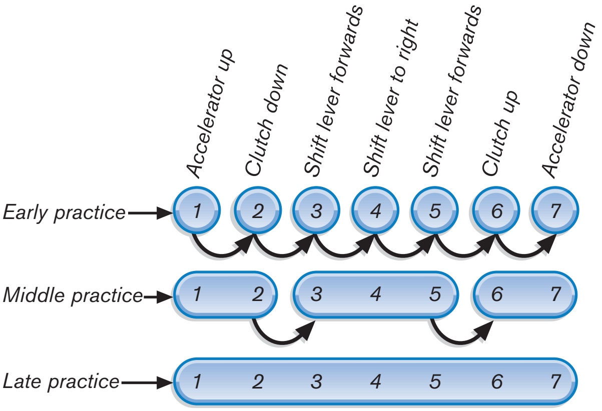


Figure 16.6 How the components of a complicated sequence like changing gear become one smooth action sequence
Source: Schmidt, 1992

ACTIVITY BOX 16.6

Automaticity and reading

In column 1 below are several words written in different colours. Your task is to name the colour in which the word is written. Do this as quickly as you can without making errors.

Repeat this for the words in column 2.

This activity can be done by pairs of students if the stimuli are projected using a Powerpoint slide. One of each pair times his/her partner for each set of words. Roles are then reversed (one person doing column 1 before column 2; the other column 2 before column 1). The average time for each set can then be calculated for the class.

(Question. Why did I suggest column 1 being done before column 2 half the time and column 2 before column 1 the other half?)

Column 1	*Column 2*
RED	BED
BLACK	SLACK
BLUE	CLUE
YELLOW	FELLOW
GREEN	DREAM
BLACK	SLACK
YELLOW	FELLOW
GREEN	DREAM
BLUE	CLUE
RED	BED

A major difference between experts and novices lies in the way they represent a problem. Experts spend more time initially making sure they understand the nature of the problem and what exactly is required. So, in physics, experts will represent problems in terms of their underlying principle, such as Newton's laws of motion, rather than in terms of their superficial characteristics, such as the fact that they involve particular mechanical devices with incline planes, wheeled carts and pulleys (Chi et al., 1989). This time is well spent because it makes it less likely that when they come to solve the problem they will make errors or waste time on false solutions.

Another major characteristic of expertise is the way this vast store of knowledge is structured and organised. Experts' knowledge seems to be stored as schemata (De Groot and Gobet, 1996) that, in chess, encode set pieces, different types of board position, different strategies, different endgames and so on. As we saw in the chapter on memory (Chapter 14), chess masters' ability to reproduce board positions from memory was significantly better than that of less expert players, but only when the board positions were meaningful. They weren't any better when the pieces were placed randomly (Simon and Chase, 1973). Schemata were making the encoding and recall of board positions easier.

These researchers went on to look at the pattern of recall. All players were doing their recalling in chunks: putting a few pieces into place, pausing, then a few more, pausing again and so on. The difference between experts and the lesser players was the size of these chunks. The experts' chunks were bigger.

Differences in knowledge and the organisation of this knowledge are reflected in the way experts go about solving a problem. Experts work forwards (Sternberg, 1999): they start at the beginning and work through to the end of a problem. Novices tend to work back from the intended solution and change the approach to the problem more frequently. Because of their huge knowledge base, experts have less need of heuristics. They are likely to have come across similar problems before and their approach is more likely to be algorithmic.

However, even experts can make mistakes. Remember the recent problem with the Millennium Bridge across the River Thames, which famously 'wobbled' when the first pedestrians walked across it? The architects and engineers building it were clearly very experienced and expert in their field, but, nevertheless, they made a mistake that turned out to be hugely embarrassing, time consuming and expensive.

Self-test: How do novices differ from experts?

Summary

This chapter has been concerned with various aspects of thinking. We began by looking at how people solve problems and some of the barriers to problem solving. After that, we looked at various aspects of inductive reasoning as found in concept learning, judgements and decision making. We touched briefly on deductive reasoning before discussing the factors involved in skill and expertise.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe some of the ways in which we solve problems and some of the barriers to problem solving.
2. Compare contrasting theories of problem solving.
3. Describe how we acquire concepts of different kinds and compare opposing theories.
4. Describe how we make judgements about probabilistic events and the biases that influence these judgements.
5. Describe how we make decisions and also the biases that affect this process.
6. Outline the basic characteristics of deductive reasoning.
7. Describe the main stages of skill acquisition.
8. Describe the main characteristics of expertise.

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3 Do we humans make judgements and decisions in a rational way, taking into account all the information available?

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CLASS ACTIVITY 12.1 answers

1 A simple experiment for grouping because of proximity (Figure 12.2b) might be one in which the relative distance between the six lines in either of the figures is slowly varied until the grouping changes. This point would be noted. Discuss this hypothetical point in terms of relative proportions in the regrouped figure.

2 A simple experiment might use the simulator and ask subjects to make an instant stop as close to a wall as possible (impacts count as errors). The distance from the wall, i.e. from impact, would be measured. The speed of approach could be varied and the distance from impact plotted as a function of approach speed.

CLASS ACTIVITY 13.1 answers

1 Students need to compare performance on the driving simulator as a function of the secondary task. Have a discussion about which of the secondary tasks would have the biggest detrimental effect and why.

2 Generally here, there are some components of the game that need to be heavily practised so that they become automatic e.g, in tennis hitting the ball so that it stays in and doesn't hit the net, regardless of whether the player is stationary or moving and regardless of position. The purpose of doing this is to free up cognitive capacity that can then be devoted to strategic and tactical aspects of the game e.g. trying to manoeuvre your opponent into a position to deliver the winning shot.

ACTIVITY BOX 14.3 answers

Answer: the spelling task by itself should be the easiest. Next comes the spelling with the digit load, because even though you were doing two tasks at the same time, the degree of interference between digits and letters is minimal.

The letters and spelling should be the hardest because there is both a memory load and maximum interference between tasks.

CLASS ACTIVITY 14.1 answers

1 Three simple tasks might be: judgements about the ethnicity of a face, the attractiveness of a face and the personality of the person. An unexpected test of face recognition would be the measure. The important point is that there would almost certainly be no independent measure of depth of processing. This is the main weakness of LoP.

2 In a simple experiment of three conditions, one group might be asked to free recall, a second group would free recall and use an explicit retrieval cue such as age groups, and a third group would use free recall plus age groups plus a retrieval cue such as location of first meeting. One would expect each of these retrieval cues to produce (additional) names that free recall doesn't.

3 A simple experiment might be one in which memory for last week's episode of TV soap, 'EastEnders', can be affected by showing the participant several subsequent episodes of 'EastEnders'. Recall of the original will be poorer and show more intrusions than a control. The control would be shown several episodes of 'Coronation Street' after the episode of 'EastEnders'. The important variable is the similarity of the interfering material to the to-be-remembered material.

ACTIVITY BOX 15.3 answer

The answers are: (1) sextant; (2) abdicate.

CLASS ACTIVITY 15.1 answers

The answers are:

1 direct can, indirect can
2 direct can, indirect can't
3 direct can't, indirect can
4 direct can't, indirect can't
5 can regular words, can't irregular words
6 can frequent words, can't infrequent words

ACTIVITY BOX 16.1 answers

Solution: to solve the problem you need to change your perception of the pliers' normal function; you need to overcome your functional fixedness and see the pliers as a weight that can be tied to one of the pieces of string to make a pendulum; it then becomes possible to catch the swinging pendulum while holding the other piece of string.

CLASS ACTIVITY 16.1 answers

1 A simple experiment might be one in which novices in different conditions have different amounts of practice with simple puzzles and are then tested on a difficult puzzle. Time to solve as the dependent variable. Discuss why practice is likely to benefit performance in terms of learning the basic rules with simple puzzles which can then be applied to more difficult puzzles.

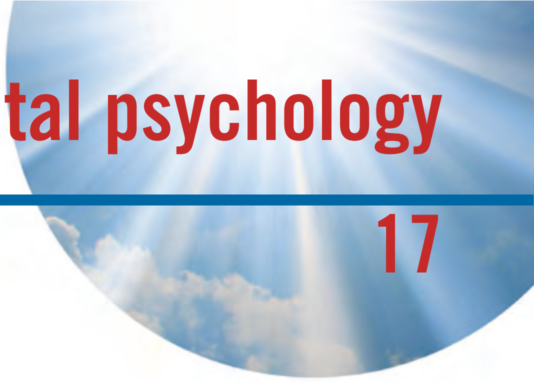
2 A simple experiment might be one in which there are two or three levels of exposure to reports of violent crime (e.g. number of reports in newspapers) and in which the participants subsequently rate the probability of being mugged. The explanation for predicting an effect of amount of exposure would be the availability heuristic.

sectionfour

David Messer

Developmental psychology

17 An introduction to developmental psychology 235
18 Cognitive development: thinking, information and representations 250
19 Communication, language and literacy 268
20 The self, others and social relationships 284



17

An introduction to developmental psychology

Route map

This chapter starts by considering what is meant by the term ‘development’ and then there is a brief review of the way that development is influenced by genetics and experience. This is followed by a consideration of the effects of extreme environments on development, and then a consideration of the way genetics influences development. The chapter ends with a discussion of the research designs and methodologies used by developmental psychologists.

Introduction

Consider the following:

- A newborn sticking her tongue out in imitation of what her father has just done.
- A 9-month-old baby crying in distress when his mother leaves him.
- A 20-month-old child starting to put words together to communicate with her older brother.
- A child with autism who is having difficulty interacting with people.
- An 8-year-old girl who is reading quickly and efficiently.
- An adolescent who is arguing with her parents.

Research findings by psychologists have contributed to our understanding of all these behaviours. This area of research is described using various terms; each gives a slightly different emphasis to the type of investigation being conducted (see Activity box 17.1).

ACTIVITY BOX 17.1

Terminology about change and development

- Child development: the study of changes during childhood (i.e. up to and sometimes including adolescence).
- Child psychology: the study of psychological processes during childhood.
- Developmental psychology: the study of the way psychological processes develop in childhood and sometimes in adulthood.
- Life-span development: the study of development across the life span, with as much attention paid to adulthood as childhood.
- Developmental science: the use of models of cognitive processes to study development.

Particular areas of investigation are often identified by the use of terms like cognitive development or social development.

- *Infants*: children below about 24 months of age.
- *Peers*: children of the same age.
- *Siblings*: brothers and/or sisters.

In developmental psychology there tends to be an assumption that whatever is being studied will be different at different ages. As you can see, a common thread running through the areas of study listed here is a focus on change and development. Write down what you think is meant by these two terms.

Change and development

It has been suggested that change, unlike development, can involve a decline in the abilities of a person, such as that occurring in very old age. Furthermore, simply getting bigger does not necessarily involve development. For example, corals grow by adding single cells to give the large exotic structures we see in films of underwater life. However, these cells are not specialised or different from any other cell. As the coral grows there is no change in the organisation or structure of the coral. In contrast, when a child develops there is increasing specialisation (e.g. the development of speech from a range of nonverbal communication) and increasing integration (e.g. the way language becomes incorporated into many cognitive processes).

The idea of development also involves the contradictory ideas of continuity and discontinuity. If there were no change across different ages there would be a high degree of continuity, but we would not consider development to have taken place.

The changes shown in Figure 17.1 are dramatic and involve discontinuity in abilities and characteristics, but most of us are happy to accept this as development, because we know that the same individual continues to go through all these changes and perhaps because we know that there are complex biological processes that enable these changes to take place. Continuity in certain characteristics can also be seen within each part of the butterfly's lifecycle – for example, the way the newly hatched caterpillar grows into its mature form.

Development also involves related issues about prediction and individual differences. These are questions about whether the characteristics or the experiences at one point are related to later development. To return to the example in Figure 17.1, we might want to know whether the largest caterpillars will become largest butterflies.

A further example may help to clarify these points. If there is some form of continuity then we should be able to predict later characteristics from earlier characteristics, such as scores on an IQ test. Interestingly, it is rare for psychological characteristics to be highly predictable from one age to another. In this sense, discontinuity and unpredictability are features of development. This may be a cause for scientific disappointment, but it is also reassuring that there is flexibility in our life path.

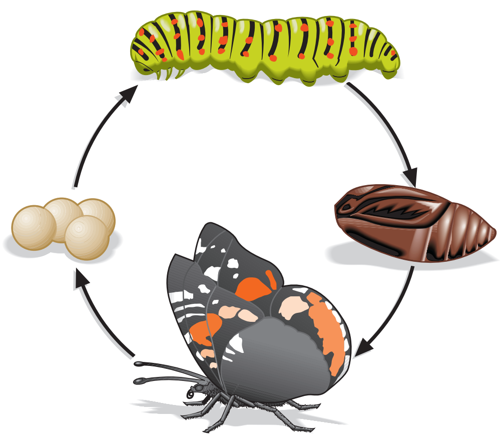


Figure 17.1 Development from egg to butterfly

Self-test: What 'special' terms are used in the psychological study of children? Explain what each of these terms means.

What causes development? A continuing concern

Many of us know about the broad features of human development. Most of us also have ideas about what factors influence development and some type of 'theory' about the mechanisms of these processes. However, such theories are usually based on unsystematic observations. Developmental psychologists seek to remedy this situation by providing information about the growth of a whole range of abilities. In addition, they also seek an understanding of the way that this growth takes place. Thus, developmental psychology can be characterised by asking the following two basic questions:

1. Does ability change with age?
2. How do these changes come about?

Many of the debates about the mechanisms of development have been concerned, in one form or another, about whether development is the result of experience or the result of our inherited abilities. This is often known as the nature–nurture debate, or sometimes the debate between empiricists and nativists (see Chapter 5). Given the common-sense notion that we are the result of both genetics and experience, it may seem surprising that there continue to be arguments about the relative contribution of these processes. Part of the reason seems to be that the debate concerns the fundamental mechanisms that underlie development.

The philosophical discussions of nature and nurture during this 'age of enlightenment' provide examples of this debate. John Locke (1632–1704) believed that children's minds were a *tabula rasa* (Latin for 'blank slate') on which experience would write. Another significant figure was Rousseau (1712–78), who believed in the essential goodness of children, a capacity that could be influenced by experience, and as such his ideas were a move away from the extreme positions of empiricists and nativists. These discussions were primarily of a theoretical nature and did not involve empirical studies.

In contrast, work in the 19th century began to involve observations that were linked to theory. Charles Darwin's careful observations in animals and humans provided a basis for his discussion of the development of emotions. The ideas of Freud had a basis in his case notes involving the recollections of adult clinical patients about their childhood and from these he drew attention to the importance of childhood in the formation of adult characteristics. However, it is worth noting that his work did not involve the study of children themselves.

Binet (1857–1911) was concerned with the systematic collection of data to enable the construction of the first intelligence test for children (Binet and Simon, 1905). The test originated from concerns about identifying children who were not making good progress in French schools so that alternative provision could be made for them.

At about the same time, G. Stanley Hall (1844–1924) was influential in drawing attention to the need for research into child development and, as a result, he is often seen as the founding father of modern developmental psychology. His contribution was to emphasise the scientific approach to data collection.

Another important figure in the development of tests is Arnold Gesell (1856–1961), who wanted to chart the milestones of early childhood as a way of documenting the maturation of innate characteristics.

Between the 1930s and 1950s, because of the prominence of behaviourist views (see Chapter 2) much of the theorising in Britain and the United States was limited to observations of behaviour, and explanations of development involved learning theory. For example, John B. Watson (1878–1958) concentrated on the way that reward and punishment influenced the developmental process. The same approach could be seen in the work of B. F. Skinner (1904–90), a leading exponent of learning theory. In both cases, the role of nurture (or, more precisely, experience) was emphasised and the role of nature was largely ignored. However, although learning theory can be used to explain many of our activities, it does not provide a satisfactory explanation of certain types of activity. This became apparent when Skinner (1957) tried to use the theoretical principles of learning theory to explain language acquisition.

Chomsky's (1959) dismissal of Skinner's account of the acquisition of language was a significant criticism that was part of a general reaction against learning theory at the time. Accompanying this was a reassessment of the role of innate predispositions and an interest in children's thinking.

Other significant findings that fuelled the reaction against learning theory involved the work of Harlow (1958) and of Schaffer and Emerson (1964), who showed that attachment to parents was not based on the availability of simple reinforcements such as food. From a different perspective, Bandura's (1977b, 1986) findings about the effectiveness of

Photo 17.1 Children with bobo dolls.

ACTIVITY BOX 17.2

The usual suspects

Which of these theoreticians do you think would agree with each of the following statements?

- Human abilities are mostly the result of rewarding appropriate behaviour.
- Both inherited abilities and the environment play a part in the development of children.

Photo 17.2 These are people who have made a significant contribution to our ideas about development (left to right: Skinner, Piaget and Chomsky).

observational learning also provided a further attack on the idea that human behaviour is solely the result of direct reinforcement. His work is famous for showing that children who had seen an adult performing aggressive actions directed towards a large 'bobo' doll carried out similar aggressive actions when left alone with the doll.

During the 1960s, researchers in Britain and the United States were also becoming better informed about the work of Jean Piaget (1897–1980) and Lev Vygotsky (1896–1934). Both theoreticians had already rejected learning theory and their ideas found a receptive audience (see Activity box 17.2).

Piaget's focus was on cognitive development, which he showed could be central to psychological research. Part of the appeal of his approach was his suggestion that children actively constructed their knowledge of the world; this was in contrast to learning theory, which seemed to suggest that children were passive recipients of information.

Vygotsky's ideas have appealed to those who believe that social interaction and culture provide the basis for human learning and development. From this perspective, psychological development is not an individual struggle with facts and concepts. Instead, development is facilitated by adults or peers who help children 'nurture' new understandings.

There has also been a growing realisation that children affect the environment around them and are not necessarily passive recipients of the experiences provided by carers (Bell, 1968). For example, babies who cry more and are more difficult than others to soothe are likely to have a different effect on their parents than babies who do not cry very much and are easy to soothe.

The last 20 to 30 years have seen a considerable expansion of research in developmental psychology. Major conferences attract several thousand delegates, who present and listen to research findings. Today there are no widely accepted general theories that dominate developmental research. Instead, each area uses theories and investigative procedures to suit the topic under investigation. After all, there are many different levels of explanation of developmental phenomena – ranging from genetic and neurophysiological to those that focus on cognitive or social processes and others that are concerned with the wider impact of society as a whole.

The growth in research into child development has also raised questions about whether the whole of adult life should be seen from a developmental perspective. An influential figure who brought this issue to prominence was Erikson (1902–94), who proposed that there are eight stages of psychosocial development across the lifespan. Another important figure has been Baltes, who emphasised the need for a 'lifespan' developmental perspective.

Self-test: Identify major theories about child development. Think about the position of each theory in relation to the nature–nurture debate.

Effects of the environment

Extreme effects of the environment: deprivation and recovery

Unfortunately, the role of 'nurture' can be seen in cases where there has been a severe lack of care (deprivation). In the 1940s and 1950s some institutions for children provided minimal levels of psychological support, play objects were largely absent and care was usually given in an interpersonal and authoritarian manner. This reflected a general lack of appreciation of the importance of positive social experiences.

Dennis (1973) documented the dramatic beneficial effects of transferring infants from a Lebanese orphanage to more favourable circumstances. In the orphanage, the children were given adequate physical care but minimal social contact. White sheets were even tied round their cots to isolate the infants and if the babies cried they were unlikely to get a response. These children showed severe delays. Children who were adopted by the age of 2, despite having very low IQ scores at this time, achieved normal IQ (intelligence quotient – see Chapter 30) scores when they were older. Girls who stayed in the orphanage and then went on to a school that provided only a very poor level of education had an IQ of 50 at the age of 16. Boys who went on to a more stimulating school fared better and their average IQ score was 80.

More recently, similar outcomes have been observed with children who have been adopted into the UK from orphanages in Romania, where care levels were extremely low both in terms of physical and psychological resources (Rutter and the English and Romanian Adoptees (ERA) Study Team, 1998; O'Connor et al., 2000). A comparison was made of children who were adopted before the age of 6 months and born either in Romania or the UK. At later ages there was no appreciable difference in the development of these two groups. Children who were adopted from Romania after 6 months of age showed increasing effects of having been left in an impoverished environment. Those adopted when aged between 6 and 24 months had scores about 15 IQ points below the UK control group who had a similar age of adoption; Romanian children adopted between 24 and 42 months had scores about 25 IQ points below those of another UK control group (scores which can be considered to involve learning disabilities).

Disadvantage, resilience, intervention and development

The previous section provided examples of the effects of extreme deprivation and the way that early rehabilitation can reverse such effects. In relation to this, it should be remembered that even in less extreme environments it is well established that family circumstance (such as income, social class and education) predict children's development, educational attainment and employment (McGurk and

APPLICATIONS BOX 17.1

Birth difficulties: biology and environment

Can the environment compensate for initial biological vulnerability? One much quoted study that answers this question was conducted by Werner and Smith (1982) on an island that is part of Hawaii. They carried out a study that followed up all the infants born on the island. Their findings indicated that for infants who came from poor economic backgrounds, difficulties at birth such as lack of oxygen (anoxia) were associated with lower scores on IQ tests, but for infants from middle to high economic backgrounds there was no detectable effect of having had adverse birth experiences. Thus, outcome appeared to be an interaction of biological factors and environment. Psychosocial factors associated with higher incomes such as more resources and better educated parents apparently could compensate for biological vulnerability.

Babies born before 38 weeks after conception are considered to be preterm. Babies born before 32 weeks are considered to be very preterm and until recently had a very poor chance of survival, but medical advances have changed this. However, the psychological abilities of very preterm infants often are impaired. A comparison study of 264 very preterm infants with a sample of full-term infants who had similar family backgrounds (mother's age, family economic status, marital status) was conducted by Wolke and Meyer (1999). At 6 years, the very preterm infant group had lower scores than the control sample on tests concerning information processing, grammatical understanding and grammatical production, as well as the naming of letters and numbers. In addition, the average scores of the very preterm infants were significantly below those expected of typical children. This is not to say that all high-risk infants had developmental difficulties, rather a high proportion experienced these difficulties.

As well as babies who are preterm being at increased developmental risk, babies who are below their expected weight are also at increased risk. Infants below 2500 gm (5.5 lbs) at birth are considered to be of low birth weight and those below 1500 gm are considered to be of very low birth weight, while those below 1000 gm are classified as of extremely low birth weight. Wolke (1998) has argued that preterm infants above 1500 gm only have a slightly increased risk of developmental difficulties and for these infants a positive family psychosocial environment can enable typical development to occur. However, he suggests that lower weight premature infants are more vulnerable and even the use of intervention programmes has not markedly improved their outcomes.

Soriano, 1998). Webster-Stratton (1999) identified four factors that put children at risk of later problems:

1. Low family income, economic crises in the family.
2. Family problems such as violence, abuse and family arguments.
3. Rejection by parents or peers.
4. Being a member of a deviant peer group.

It was estimated that the presence of two or more of these factors meant that an individual was *four times* more likely to develop mental health problems and those who experience all four risk factors are *10 times* more likely to have such problems (see Applications box 17.1).

However, it is also the case that many individuals overcome disadvantage and are resilient in the face of adversity (Garmezy, 1983; Masten et al., 1990). In broad terms, resilience appears to be promoted by two factors: the presence of an adult who provides responsive care towards the child and the child having personal characteristics such as intelligence, a sense of their own worth and ability and responsiveness to others. Compensatory intervention programmes have been developed by governments in an effort to counter the effects of disadvantage (see Applications box 17.2).

Self-test: Does extreme deprivation always have a harmful effect on child development? Identify research findings that support your answer.

Chemicals, biology and early development

Discussions of nurture have tended to place emphasis on the role of experience in affecting psychological development. However, the environment can affect the biology of an individual and, in this way, affect psychological development. Some of the best examples of this process can be seen in what are termed teratogens. These consist of a range of agents such as radiation, pollution, alcohol, illegal drugs and prescribed medicines. They can affect the development of the unborn child and can cause anything from mild problems to death (see Applications box 17.3).

In very general terms, the effects of teratogens are greatest during embryonic development (3 to 8 weeks after conception); this can be a time when the mother does not realise she is pregnant. However, different teratogens have different effects at different ages. The ages at which the effects of a teratogen are greatest are known as sensitive periods. For example, the drug thalidomide was given to pregnant women as a sedative during the 1960s. The most serious effects occurred when the drug was taken between

APPLICATIONS BOX 17.2

Head start

One of the biggest intervention programmes was launched in 1965 in the USA and was called 'Head Start'. This preschool programme, involving several million children, was designed to assist cognitive and linguistic development and to prepare children for school. The early evaluation of the programme suggested there were few gains and those that did occur were temporary. However, later evaluations provided a more positive picture. Weikert et al. (1970) compared children who were involved in a 12-hour, weekly preschool programme that involved communication and active learning, with a control group whose members were not enrolled in the programme.

The intervention group showed higher IQ scores than the control group in the first 2 or 3 years following the programme. However, this difference decreased as the children became older and by 14 years the IQ scores of both groups were nearly identical. Nevertheless, more general benefits of the programme were identified. At 15 years of age the intervention group had higher scores on reading, arithmetic and language. In addition, only 19% of the intervention group were placed in remedial school programmes compared to 39% of the control group.

A follow-up of the sample when they were 27 years old revealed that those in the intervention group were much less likely to have been arrested (7% versus 35%), were four times as likely to have higher earnings and three times as likely to own their own homes (Weikert, 1996).

Weikert argued that these positive outcomes were due to the programme empowering:

- children to be active learners and decision makers
- parents to support their children and work with teachers
- teachers, by providing additional training and support.

More recent discussions of intervention programmes have drawn attention to the benefits of the whole family supporting learning, and making wider changes to the resources available.

In the UK a programme called Sure Start was initiated in 1999 to enhance the health and development of children who are under 4 years and live in socially deprived areas. The programme involved decisions being taken locally about the type of intervention that was adopted. The research did not involve the use of any control groups for comparison. A large-scale evaluation of the programme by Belsky et al. (2006) suggests there only have been a limited and small effect on children aged 36 months.

the fourth and sixth week after conception. At this age the limbs are developing and the drug interfered with their development. Taking the drug at other times had no major effects.

The effect of a teratogen will also depend on the amount of the substance and the length of exposure. In addition, there can be cumulative effects of several teratogens (e.g. smoking and alcohol). It also seems to be the case that some mothers and their children are more affected by teratogens than others.

The foetus is not just affected by external chemicals or diseases. Huttunen and Niskanen (1978) investigated the hormones associated with maternal stress to see whether they have an effect on later development. To do this, they followed up children born in Europe during the Second World War. They compared individuals whose fathers had died shortly before they were born with children whose fathers had died shortly after they were born. In both cases, the mothers were likely to experience stress, but the hormones could only have been transmitted to the unborn children in the first of these two groups. The investigators were careful to obtain the participant sample from regions

APPLICATIONS BOX 17.3

Effects of selected teratogens

- *Cigarettes*: reduce oxygen available to foetus, reduce foetal movement, cancer-causing agents are transmitted to the foetus, birth weight is often reduced.
- *Alcohol*: passes into blood stream of foetus and may cause death of brain cells; excessive drinking can result in foetal alcohol syndrome (FAS), which involves facial deformities, learning disabilities, attention problems and hyperactivity; binge drinking is believed to be particularly problematic.
- *Cocaine*: associated with premature birth and small head size; there is poor attention in some children and over-arousal in others.

where alcohol and cigarettes were unobtainable, to eliminate the common association between stress and these drugs. Those in the sample whose father had died when their mother was pregnant were, in comparison to the other sample, at greater risk in adulthood of developing emotional problems and behavioural disorders.

Self-test: List some of the effects of chemicals on development. Should these be considered an effect of nature or nurture?

Genetic effects on development

The beginning of life and genetics

Prenatal development involves remarkable changes that occur in the short space of time before birth. In a period of about 8 months a single cell develops into the complex organism that is the newborn baby.

The mother and father of a child usually have 23 pairs of chromosomes (see photograph). Female eggs contain a random selection of half the chromosomes of the mother and sperm contain a random selection of half the chromosomes of the father. The start of life can be considered to occur when a male sperm and a female egg are united to form a zygote and as a result the new individual has 23 pairs of chromosomes. Each chromosome is made up of very many genes; these are regions of the chromosome that influence the development of a particular characteristic. Because there are two chromosomes, there are two sets of genes for each characteristic, one from the mother and one from the father.

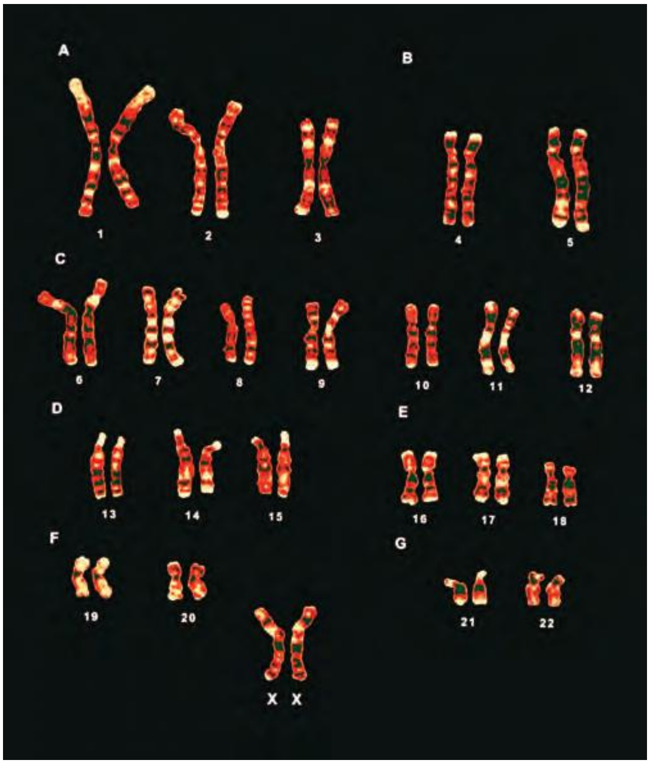


Photo 17.3 The 23 pairs of human chromosomes.

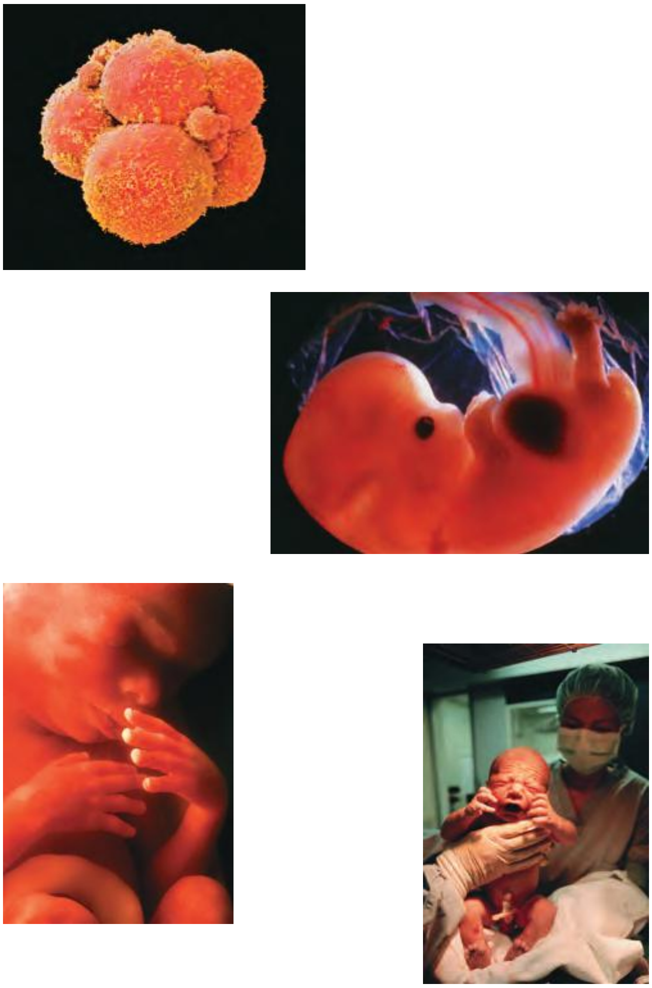


Photo 17.4 From zygote to newborn.

After conception, the size of the zygote increases by the process of cell division. At about the third week after conception the cells become implanted on the uterine wall, which marks the beginning of the embryonic stage. Later, from the ninth week until birth, the term ‘foetus’ is used to refer to an unborn child.

The process of cell division and specialisation that occurs before birth is a fascinating one. Every time cell division occurs, the two new cells have the same genetic material as the original. As a result, every cell in our body contains the same genes and chromosomes and these are unique to each of us. This is why ‘genetic fingerprinting’ enables scientists to decide whether a piece of hair comes from a particular individual.

As cell division increases, the cells become more specialised and have different functions from those in the

RESEARCH METHODS BOX 17.1

Habituation

Lecanuet (1995) repeatedly played the sound 'babi' to 9-month-old foetuses. At first there was a brief but noticeable slowing of the heartbeat, but with repeated playing of 'babi', this response progressively decreased in size. This decrease is called habituation and involves an initial reaction to a stimulus that becomes smaller with repeated presentations.

The opposite process is *dishabituation*. This involves the recovery of the response when a different stimulus is presented. In this experiment, after habituation had occurred, the sound 'biba' was played and the heartbeat showed a noticeable slowing to the new sound.

These findings show that learning can take place even before birth. As we will see, habituation is an important research tool in the study of infants.

original zygote. The genetic material and the environment of the cell influence what type of cell it will become (neuron, muscle cell and so on). A complex process of cell migration (movement) and cell differentiation (the change in the character of cells) enables the formation of different parts of the body.

It is often assumed that a newborn infant is a 'pure' example of genetic characteristics that have been isolated from environmental influences. However, this is far from being the case and even before birth both genetics and environment can affect development. For one thing, a foetus is not a passive creature – he or she can move (from 7 weeks), hear sounds (from 24 weeks) and can taste liquids. The foetus also demonstrates a process of learning called *habituation* (see Research methods box 17.1).

Self-test: Explain the process which results in people having genes from both their mother and their father. Also explain why children in the same family have different genes.

How do genes affect development?

The term genotype is used to refer to the genetic characteristics of an individual. However, genes usually interact with the environment. The result of these

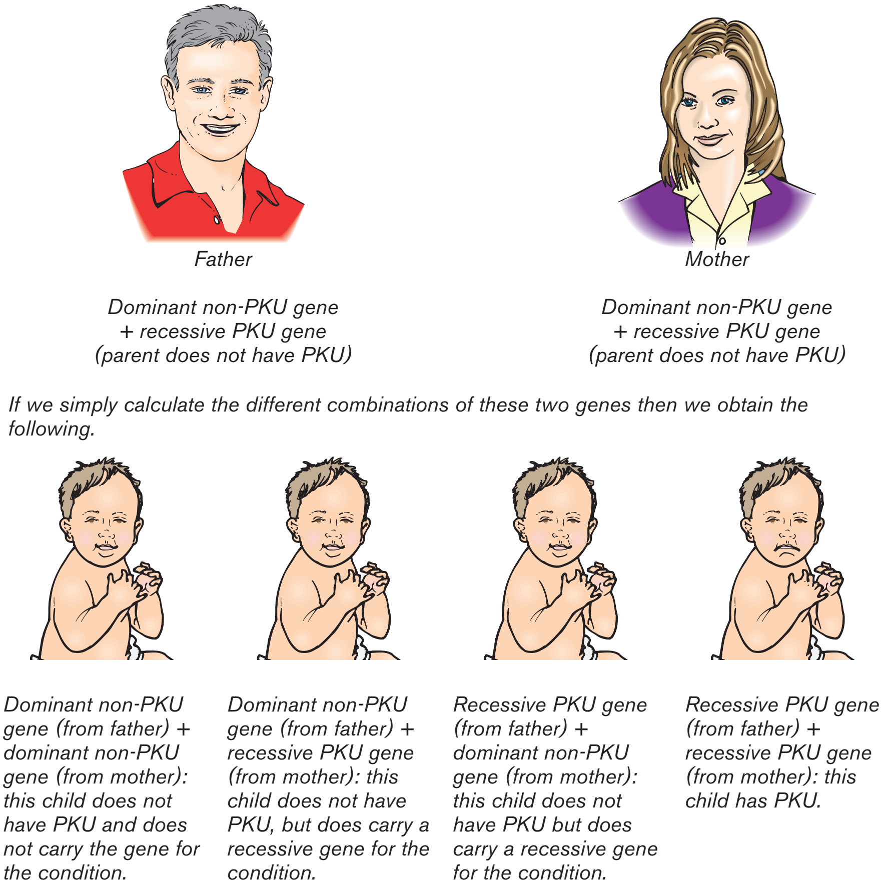

Father
Dominant non-PKU gene + recessive PKU gene (parent does not have PKU)
Mother
Dominant non-PKU gene + recessive PKU gene (parent does not have PKU)
If we simply calculate the different combinations of these two genes then we obtain the following.
Dominant non-PKU gene (from father) + dominant non-PKU gene (from mother): this child does not have PKU and does not carry the gene for the condition.
Dominant non-PKU gene (from father) + recessive PKU gene (from mother): this child does not have PKU, but does carry a recessive gene for the condition.
Recessive PKU gene (from father) + dominant non-PKU gene (from mother): this child does not have PKU but does carry a recessive gene for the condition.
Recessive PKU gene (from father) + recessive PKU gene (from mother): this child has PKU.

Figure 17.2 The inheritance of PKU

interactions between genes and environment is known as a *phenotype*. It is important to realise that the genotype is not the maximum potential of an individual; rather, the genotype can give rise to a range of characteristics. For example, a person's height is something that is highly determined by genetics (see later), but someone who is malnourished will be very much smaller than someone growing up in more favourable conditions.

There are two major ways in which genes can affect development:

1 through mutations and genetic abnormalities
2 or through the process of inheritance.

Mutations are the result of an unusual configuration of genetic material that would not be expected from the genetic characteristics of the parents. Not all mutations have a known cause. However, some do: for example, radiation from the atomic bombs in Japan caused mutations such as deformed limbs, because the radiation affected the chemical composition of chromosomes. Although many mutations adversely affect development, some may be positive and it is thought that in the past these could have resulted in evolutionary advances.

Some chromosomes seem especially susceptible to mutations and usually involve the removal or duplication of genetic material. Usually, there is no obvious cause for the occurrence of the mutation. The most common genetic disorder is Down's syndrome, which usually involves an extra 21st chromosome. Children with Down's syndrome often have learning disabilities and a range of health problems. In the case of Down's syndrome, increasing maternal age is associated with increased incidence of a child having the syndrome and there may also be a genetic component that increases the probability of some people having a child with the syndrome.

As already mentioned, there are two genes for each characteristic of a person, one gene inherited from the mother and one inherited from the father. A dominant gene influences the development of characteristics associated with it and will override the influence of any recessive gene (a well-known example of this is the gene for brown eyes being dominant over the gene for blue eyes).

It is relatively rare for dominant genes to have an extremely adverse impact on development. This is because, in our evolutionary history, individuals with these characteristics were much less likely to be able to reproduce. An example of the adverse effects of a dominant

ACTIVITY BOX 17.3

Nature, nurture and intelligence

The genetic similarity between two individuals can range from:

- 100% similarity, as in the case of identical twins who have exactly the same genetic makeup; these are often termed monozygotic (MZ) twins because they are the result of a single zygote (i.e. fertilised egg) that has divided to make two individuals immediately *after* conception
- an *average* of 50% similarity as in the case of: (i) non-identical twins (dizygotic (DZ) twins who are the result of two different eggs being fertilised); (ii) children who have the same parents.

The word 'average' is used here because, sometimes, two individuals in the same family will, by chance, have very similar genes and sometimes, by chance, two individuals will have very different genes. Remember that the genes in a baby are the result of a random selection fromhe two sets of genes of the father and from the two sets of the genes of the mother. As a result, in theory, a girl could inherit from her mother exactly the same genes as her sister, or she could inherit exactly the opposite set of genes – these events are, however, highly unlikely to occur.

When evaluating the influence of genetics on development, it is important to try to make comparisons that take into account the influence of different environmental experiences. For example, identical or non-identical twins who are reared together will have more similar experiences than children who are of a different age in the same family.

The process of adoption also provides a way of looking at the influences of environment. Children who are reared in different families are likely to have different experiences than those reared in the same family. It should be noted, however, that adoption panels often try to place children with families that are similar to their biological parents, thereby limiting the degree of difference between families even in a particular culture.

Having read through this information, look at Table 17.1 and try to answer the following question:

1 What does Table 17.1 tell us about the influence of genetic factors on intelligence?

A correlation of .86 means that if one monozygotic twin has a high score on an intelligence test the other twin is highly likely to have a high score. A correlation of .24 means that if one sibling has a high score on an intelligence test then it is quite difficult to predict whether the other twin will have a high or low score. (For more details about correlations, see Chapter 39.)

Photo 17.5a Identical twins.

Photo 17.5b Non-identical twins.

Photo 17.5c Children who have the same parents.

gene is Huntington's disease, where there is neural degeneration in later life. As a result, individuals with this genetic disease are able to have children and the effects of the disease usually become apparent when these children reach late adulthood.

However, there are a number of recessive genes that can adversely affect development. A recessive gene will not adversely affect development if its influence is overridden by that of a dominant gene. However, if a person inherits two of these recessive genes, then development can be adversely affected. An example of this condition is phenylketonuria (PKU), which, if untreated, can result in learning disabilities. The condition has a one in four chance of occurring when both parents have a recessive gene for this condition (see Figure 17.2).

In many hospitals, a small blood sample is taken from the foot of newborn infants to test for PKU. In this syndrome, learning disabilities are caused by a build-up of PKU that is not removed by the normal chemical processes of the body. However, by adopting a special diet it is possible to minimise the effects of PKU.

Thus, we have a complicated developmental pattern with PKU where adverse effects on development can be caused by an inherited characteristic. However, these adverse effects can be minimised by modifications to a person's environment.

Self-test: Developmental disabilities can be caused by mutations and by being inherited. Explain how these two processes differ.

Genetics, environment and intelligence

Although psychologists usually acknowledge that most characteristics of people are the result of both genetics and environment, this topic continues to generate discussion and debate. One area where this debate is particularly fierce is with regard to intelligence. Tackling the exercise in Activity box 17.3 will help you to understand this topic.

Data similar to those in Table 17.1 are used by behavioural geneticists to try to understand the relative influence of genetics and environment on particular characteristics, such as intelligence. Analyses tend to show that about 50% of the variation in intelligence is due to hereditability (Plomin, 1990). What does this mean?

Think of your class of psychology students and imagine that they have been given an intelligence test. If we say that 0% of the variation in the scores on this test is due to hereditability this would mean that genetic characteristics had no influence on the scores. By the same token, if we say that 100% of the variation was due to hereditability, this would mean that differences in the genetics were totally responsible for the high and low scores we see. Thus, if 50% of variation is due to hereditability, we can assume that about half of the range in intelligence scores we see in this class can be explained by inherited characteristics (see Chapter 30 for a fuller discussion of intelligence and the nature–nurture issue). (See Activity box 17.4 for an activity on the nature–nurture debate.)

Behavioural genetics studies are usually based on the assumption that there are three types of contribution to development: hereditability (variation explained by genetic differences), shared environment (variation explained by individuals sharing the same environment, such as being in the same family) and non-shared environment (variation explained by individual experiences, such as birth order, or

TABLE 17.1 THE INFLUENCE OF GENETIC FACTORS ON INTELLIGENCE

Genetic relationship	Correlations	Genetics the same?	Environment the same?
MZ twins reared together	.86		
MZ twins reared apart	.72		
DZ twins reared together	.60		
Siblings reared together	.47		
Siblings reared apart	.24		

ACTIVITY 17.4

Nature versus nurture

Is nature or nurture the most important influence on psychological development? A debate can be organised around this topic with students being asked to read relevant papers and summarise the main argument from each paper in about 5–10 minutes (a good selection is provided in relation to the recommended reading for the essay questions). Depending on the size of the group there can be either a number of lead speakers and/or audience. Also depending on what amount of preparation is expected, the two sides of the debate can be asked to coordinate their arguments. The group as a whole should vote for the answers they would give at the beginning and end of the discussion.

the way individual children are treated differently by their parents).

Behavioural genetics is a controversial area of research. For one thing, it is easy to get carried away with figures from behavioural genetics studies and regard the percentages that are supplied as providing some absolute assessment of the effect of genetics and the environment on development. However, it is important to recognise that the figures concerning hereditability are only relevant to a particular sample in a particular environment. For example, if everyone in a sample has the same environment when they develop, then the effect of genetic differences would be very large. In contrast, if people in a sample experienced very different environments, then the effects of genetics would be very much smaller.

Self-test: Explain why comparisons between identical and non-identical twins help us understand genetic influences on development.

Research methods in developmental psychology

Design and development

Many of the same research techniques that are used in psychological investigations of adults are also used with children. However, the design of these studies usually differs from those used with adults. Suppose you wanted to find out whether intelligence increased as people become older or whether as you get older, intelligence declines after a certain age. How would you do this? For the answer, see Research methods box 17.2.

In relation to these issues it should be remembered that not all investigators of development involve groups of children. There have been a number of important longitudinal case studies, often conducted by one of the parents of a child. These have been valuable in giving a detailed description of changes and of raising questions about the process of development. However, such studies need to be interpreted with caution as there is uncertainty about the generality of the findings.

Self-test: What is the meaning of the terms cross-sectional study and longitudinal study? What are the advantages and disadvantages of each type of study?

Experimental and non-experimental designs

Investigations of development also differ according to whether an experimental or non-experimental design is employed. In experiments, there is one group of individuals who has an experience and another group that does not. Children are randomly allocated to these two groups, so that any differences can be attributed to the differences in experimental conditions. Such studies may take a few minutes to conduct or they may take several years.

However, it is often the case that for ethical reasons it is not possible to assign children randomly to conditions. For example, it would be unacceptable to investigate the effect of breastfeeding on intelligence by asking one group of mothers to breastfeed their infants and the other group to bottlefeed their infants. Consequently, many investigations

RESEARCH METHODS BOX 17.2

Cross-sectional and longitudinal designs

Two principal designs are used to collect data about development: cross-sectional and longitudinal. If we were conducting a cross-sectional study to find out the age at which babies produce the sound 'psy', we would collect data from babies of different ages (an example follows):

- The names of some babies who were observed when they were 4 months old: Jean Piaget, Margaret Mead, Arnold Gesell.
- The names of some babies who were observed when they were 8 months old: Mary Ainsworth, Noam Chomsky, John Watson.
- The names of some babies who were seen when they were 12 months old: William James, John Bowlby, Anna Freud.

Thus, different children are seen at each age. The advantage of this type of study is that it is quicker, and therefore less expensive, to collect the data. One drawback is that because each age group contains different children, the statistics that can be used to assess differences are less powerful (see Chapter 39).

If we were to conduct a longitudinal study, then the same children would be seen at each age:

- The names of some babies who were seen when they were 4 months old: Jean Piaget, Margaret Mead, Arnold Gesell.

The same babies would be seen when they were 8 and 12 months old.

Interestingly, cross-sectional and longitudinal studies can produce different findings. Cross-sectional studies tend to show a decline in raw scores on intelligence tests from age 20 years onwards (Weschsler, 1939). In contrast, longitudinal studies tend to show an increase in scores until age 50 and then a plateau (Schaie and Willis, 1986). Why should this be? (Try to write down at least one explanation for each of these two profiles of development.)

There seem to be two major reasons for these different findings. Cross-sectional studies that compare people in their 20s, 30s, 40s and 50s encompass groups of people who have experienced different educational systems, different lifestyles, different types of nutrition and different experiences of taking tests. These people belong to different *cohorts* and this helps to explain why younger people, who have usually experienced higher levels of resources, perform better than older people on intelligence tests.

In the case of *longitudinal* studies, there are always some people who move house and do not keep in contact with the research team or who simply become bored with taking difficult tests. When comparisons are made between the participants who remain and the participants who drop out of a longitudinal study, it is often found that those people who do less well in the tests tend to drop out. As a result, there can be an increase in the average score of the group.

Schaie (1989) overcame some of these methodological problems by conducting what are termed sequential research design studies. These began with a cross-sectional study (i.e. testing people at a range of ages), but also tested these same individuals seven years later and made adjustments for dropouts. These studies indicated that decline in IQ performance is not noticeable until about 60 years of age and then for some but not all individuals.

adopt what are termed natural experiments, quasi-experimental or correlational designs.

In these studies, comparisons are made between children who do and do not receive an experience of some sort (e.g. breastfeeding). However, because the children are not randomly assigned to experimental conditions, it is always possible that any difference between the groups is the result of some other association in the child's environment. For example, in the case of breastfeeding, mothers who do this tend to be middle class and better educated. So what we think of as an effect of breastfeeding on intelligence could be the result of the mother's social class or education.

This means is important to try to rule out confounding variables that could bias the results of non-experimental investigations. This can be achieved by the careful matching of the two groups so that they are as similar as possible in terms of any characteristic that could bias the results.

Self-test: Why is it often difficult to be sure about causal effects on child development?

Methods of collecting data

Studies also vary according to the place where they are conducted. Some studies are conducted in a child's home (such as observational studies of infant attachment to adults (Ainsworth, 1967)), street or school. The advantage of more naturalistic settings is that children are likely to feel more secure and relaxed in them. The disadvantage is that there will be differences across children in their homes, schools and streets and this could in some circumstances affect the findings of an investigation.

Other studies are conducted in laboratories that at first will be unfamiliar to the participants (e.g. studies of attachment in the 'strange situation' (Ainsworth and Wittig, 1969; see page 289). The opposite set of criticisms can be directed at these laboratory settings. Children may not behave in their normal manner in the atypical surroundings of a laboratory, but at least the context can be standardised. One should not, however, imagine that the issue is as clear cut as this. A child might feel 'at home' in a laboratory where she has been carefully introduced to the people and settings, whereas in her own home she might feel uncomfortable when an intrusive and insensitive investigator is present. Furthermore, infants are likely to respond to a laboratory much as they would to any unfamiliar location.

The actual process of recording information about children also involves a large range of different techniques. Direct observations of behaviour can be made or behaviour can be video recorded and subsequently coded. Observational studies are often time consuming and it is important to make sure that good inter-observer reliability can be obtained.

Observational studies are not limited to 'natural' situations such as the child's home, but can also take place in laboratories. The ethological approach to investigating animal and human behaviour emphasises the benefits of detailed observations in naturally occurring situations. An extension to this method of data collection, which is based on very different principles, is *ethnographic observations*. Here the observer attempts to become part of the group that is being observed and evidence about the processes in which the observer is interested is derived from samples of conversation, observations of events and so on (see Research methods box 17.3).

RESEARCH METHODS BOX 17.3

Observations in a laboratory

An example of an observational study conducted in a laboratory involves a study of infant pointing. Murphy and Messer (1977) asked mothers to draw their infant's attention to toys that were positioned on the walls of the laboratory. The sessions were recorded by video cameras positioned behind a one-way mirror. From this semi-structured situation details of the time when mothers pointed at the toys and the direction of the infants' gaze were recorded in tenths of a second by painstakingly analysing the video recordings.

From this it was possible to show that 9-month-old infants could follow points to objects directly in front of them, probably by transferring their gaze from the pointing hand to the target object. However, these infants had difficulty when mothers pointed at objects that were a long way away from the mother's pointing hand and the target object – for example, when the point was across the infant's body to an object in a corner. At 14 months old, however, the infants were successful at both types of point.

Parents can be enlisted to help provide descriptions of behaviours as diverse as language and sleeping. These data can be useful as parents will know more about their children's behaviour than investigators and can provide more extensive records. However, there can be problems with parental responses being influenced by social desirability or by a lack of objective evaluation.

Data can also be collected by interviews and questionnaires directed at children, with the obvious limitations being the communication abilities of the children. In addition, psychologists have found to their cost that children do not always provide answers that reflect what they think. Young children, partly because of their reliance on nonverbal cues when interpreting speech, often pay more attention to the context than to the content of the speech they hear. In addition, because of the unequal power relation, children often give the answers they think the adult wants to hear and may use nonverbal cues to help them guess what the 'correct' answer is.

Given the number of these dimensions, it should be apparent that there are many different techniques for investigating child development. All research methods have advantages and disadvantages and, as a result, the choice of a particular technique will usually be a matter of compromise. However, the important principle linking different techniques is that investigators' work should be able to be replicated and, if necessary, used to challenge the work of other researchers.

Self-test: Research into child development uses many different methods and designs. List as many as you can.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Understand that development can involve change, continuity, discontinuity and predictability.
2. Discuss different views about the mechanisms of development; in particular, be able to distinguish between nature and nurture.
3. Describe the effects of deprivation and disadvantage.
4. Discuss the way that genetic processes influence development.
5. Explain the way that behavioural geneticists estimate hereditability.
6. Describe longitudinal and cross-sectional designs.
7. Explain the difficulties with non-experimental designs.
8. Describe the methods of data collection used by developmental psychologists.

Further reading

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Smith, P. K., Cowie, H. and Blades, M. (2003) *Understanding Children's Development*. Oxford: Blackwell.

Essay titles and references

1 Compare two major theories of psychological development in children.

Rather than your reading specific journal articles, I would recommend looking at three or more textbooks about developmental psychology that are in your library. Read the sections about a particular theorist or theory in the books (e.g. Piaget, Vygotsky) and use this essay as a way of better understanding the nature of the theory and any criticisms of it.

2 What are the effects of extreme deprivation on children's development? Discuss whether these effects are inevitable.

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3 Outline the way in which genes affect development. Illustrate your answer with the discussion of at least one syndrome that has a genetic cause.

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Lewontin, R. C. (1997) Genes, environment and organisms. In R. B. Silvers (ed.) *Hidden Histories of Science*. London: Granta Books.

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Developmental psychology

18

Cognitive development: thinking, information and representations

Route map of the chapter

Cognitive development involves the study of the way children's thinking develops. The topic can be extended to cover almost any aspect of children's activities. This chapter focuses on children's thinking about their physical world and their ability to solve problems. (Thinking about social aspects of their world is considered in Chapter 20.) Piaget's theory of cognitive development in infancy is the first topic considered here. This is followed by a consideration of his ideas about cognitive development in childhood. Piaget's work has influenced the study of moral judgement and this is discussed next. The final section outlines more recent views about cognitive development, those involving the information processing approach, children's representations and a social perspective.

Introduction

Look at Activity box 18.1 and think about the changes that occur in the first 2 years of life.

ACTIVITY BOX 18.1

Take a look at these photos. Answer the following questions about each infant.

1. Does this infant know where to search if an objected is covered up?
2. Can this infant work out how to get an object which they see being put behind a screen?
3. Can this infant use words to refer to an absent object?

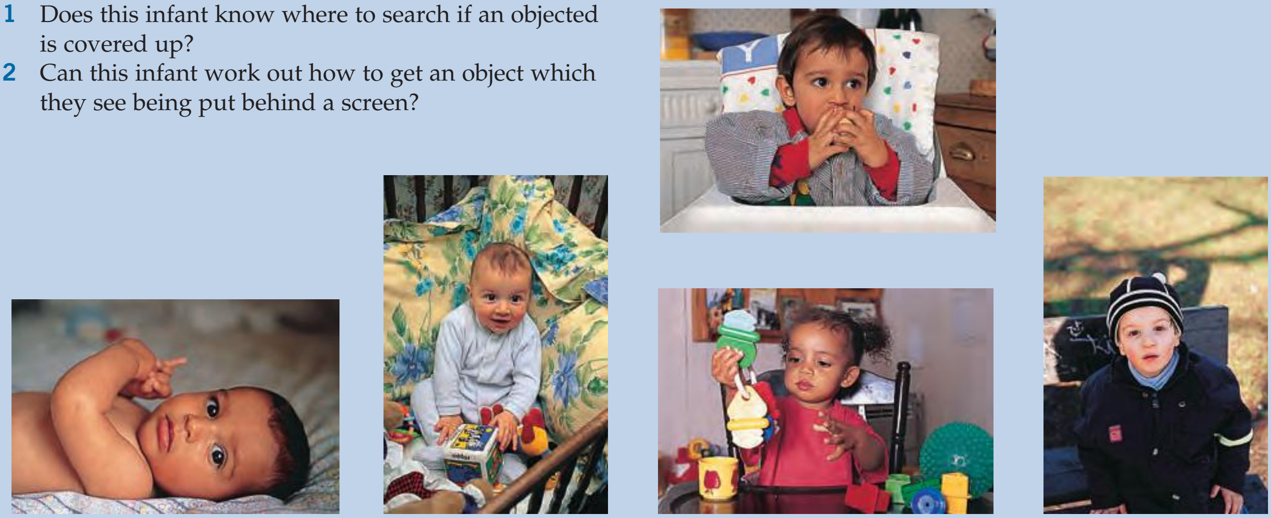


Photo 18.1 Infants at the ages of about 4 months, 8 months, 12 months, 18 months and 24 months.

Growth of cognitive abilities

Piaget's theory of cognitive development

Jean Piaget has had a particularly powerful influence on the study and understanding of infancy because he identified a number of puzzling behaviours and developed challenging explanations for them. He argued that infant thinking is different from that of adults because it involves sensations and motor movements and, unlike that of adults, is not based on language. Piaget put forward a general theory of cognitive development involving powerful processes that could be applied to any stage of development.

Piaget and his ideas about development

Piaget (1897–1980) was fascinated with the issue of the way that children acquire knowledge about their world. He originally trained as a biologist and, after working with Binet on the development of intelligence tests, devoted his life to the study of children. He produced over 200 articles and more than 30 books. A summary of his ideas about development is given in Activity box 18.2.

Piaget developed what is termed a stage theory (for the substages in infancy, see Focus point 18.1; we will discuss the other stages later in the chapter), through which children progress in a fixed order. Each stage is characterised by a certain cognitive process that influences thinking and reasoning (see Figure 18.1).

Self-test: Explain what is meant by assimilation, accommodation and schema.

A stage theory of development assumes that cognitive advances will occur in a step-like manner, but many investigators have found that development appears to be a more gradual process, especially when there are only small intervals between the times when children are observed or assessed. Another issue about stage theories is the suggestion that stages fail to encompass the range of children's thinking and abilities, so that thinking differs according to the topic rather than age or stage (for example, they master the rules of language much earlier than mathematics; see page 263).

ACTIVITY BOX 18.2

Terms used by Piaget to explain development

Piaget believed that advances in thinking occur through the processes of *assimilation* and *accommodation*. Assimilation consists of responding to stimuli using existing ways of thinking. Accommodation consists of altering existing ways of thinking/actions to adapt to new stimuli.

1. What process happens when a young child who knows the word 'duck' sees a swan and then calls this a 'duck' – is it assimilation or accommodation?
2. What happens when this child learns the word 'swan' – is it mostly a process of assimilation or accommodation?

Although it is easier for us to think of accommodation and assimilation as occurring one after the other, Piaget believed that most of the time assimilation and accommodation occur together, but that there could be different ratios of the two processes. These ideas provided an important alternative to behaviourism and learning theory, which largely ignored cognitive processes.

Piaget used a number of other terms when explaining his theory. For example, the word *schema* was used to refer to the cognitive structures that provide the basis for actions and thinking (e.g. sucking or grasping schema, or in older children a schema about the mother). Schema can be thought of as providing the units of thinking.

Other important terms are *adaptation* and *equilibration*. Adaptation involves a change in thinking to a more effective way of responding to the world. Equilibrium occurs when the cognitive system has been adapted to new information or stimuli so that for the moment there is no need for further accommodation. However, in childhood this stability is usually only temporary as it can be further disturbed by new experiences. Piaget thought that all these processes were involved not only in learning specific information, but also in changing from one developmental stage to another.

Piaget accepted that there is a 'specific heredity', such as the innate reflexes that infants have at birth, our sensory abilities and the processes of accommodation and assimilation. He also argued, however, that our experiences bring about the construction of ever more complex schema that allow us to go beyond these limitations, so that as human beings we can develop ways to think, understand and detect things that we cannot sense (e.g. ultra-violet light, gravity).

Activity: when infants modify their sucking responses to take account of the different shape of objects, this can be described as a process of (i)_____ and this results in (ii) ______ of the sucking schema (fill in the gaps using words from the following list: accommodation, adaptation, assimilation; you will find the answer below).

Answer: (i) accommodation (ii) adaptation.

FOCUS POINT 18.1

Piaget's sensorimotor stage

Substage 1: reflex activity, 0–1 months

Infants refine their innate responses (e.g. the sucking schema is modified to accommodate different-shaped nipples).

Substage 2: primary circular reactions, 1–4 months

Actions which by chance result in satisfying outcomes are repeated (e.g. moving a thumb to the mouth to suck it). There is no awareness of object permanence: if infants cannot see an object then they have no awareness of its existence ('out of sight is out of mind').

Substage 3: secondary circular reactions, 4–9 months

Infants use established schemata to explore new objects (e.g. suck and/or shake new objects). They begin, intentionally, to change their environment by repeating actions that cause interesting events. They have little awareness of object permanence.

Substage 4: coordination of secondary schemata, 9–12 months

Infants use established actions for new effects (e.g. they knock down a barrier to obtain a toy) or they use different schemata on the same object. They can imitate others. They are aware of object permanence, but make 'A not B errors' (see page 302).

Substage 5: tertiary circular reactions, 12–18 months

Trial-and-error strategies are used to obtain goals, and infants experiment with objects by varying their behaviour (e.g. dropping objects on the floor). Object permanence occurs in many, but not all, circumstances.

Substage 6: new means through mental combinations, 18–24 months

Symbolic activity starts to occur, so a sound or action can signify an absent object. There is imitation in absence of the original model. Infants can solve problems without manipulation and testing, showing that they can think about the best way to solve a problem.

Self-test: Identify the six substages of sensorimotor development.

Issues about object permanence

Object permanence involves the capacity to understand that objects continue to exist even if they are no longer visible. Piaget observed that infants below the age of 8 months who are shown an interesting object, which is then covered, do not try to uncover it. These and other observations led Piaget to claim that, initially, infants do not understand that objects continue to exist when they can no longer be perceived.

Support for this idea came from a study by Bower and Wishart (1972). They found that 5-month-old children could retrieve an object from under a transparent cup but not an opaque cup, indicating had infants had the hand coordination, but not the cognitive understanding, to carry out the task.

However, other findings have challenged Piaget's claims. Bower and Wishart (1972; see also Hood and Williats, 1986) found that 5-month-old children would reach for objects in the dark when the light was turned off before the start of their search, contradicting Piaget's claims that an object ceases to exist for infants when they can no longer see it.

A related topic concerns what has been termed the 'A not B error'. Piaget (1954) observed that one of his children could find a ball that had rolled to the same place under a sofa on a number of occasions (location A), but when the ball was rolled to a different place (location B) the search was made at the original location (A). Piaget interpreted this as an incomplete understanding of object permanence, the response seeming to be based on learning that certain actions are successful. Older children, of about 12 months, are successful at this task, but they still do not have the same awareness as adults. This can be seen when an object is placed under a cover, but the cover and object are moved by the experimenter so the object can secretly be dropped into a box. The cover is then returned to its original position. Infants will look only under the cover and do not search the box. At about 18 months, however, they will also look in the box.

Other explanations have been put forward about the A not B error. One is that infants simply have a poor memory. Support for this explanation was obtained by Harris (1973), who found that errors were reduced if infants were allowed to search immediately on the B trials. In addition, Gratch et al. (1974) found fewer errors at B if the delay was less than 1 second. They suggested that the direction of a search is based on postural orientation and supposed that this information is lost when a delay occurs. However, the memory explanation has been undermined by Butterworth's (1974) findings that B errors occur even when the object is visible. A further difficulty for all these accounts is that infants will exhibit the error even if

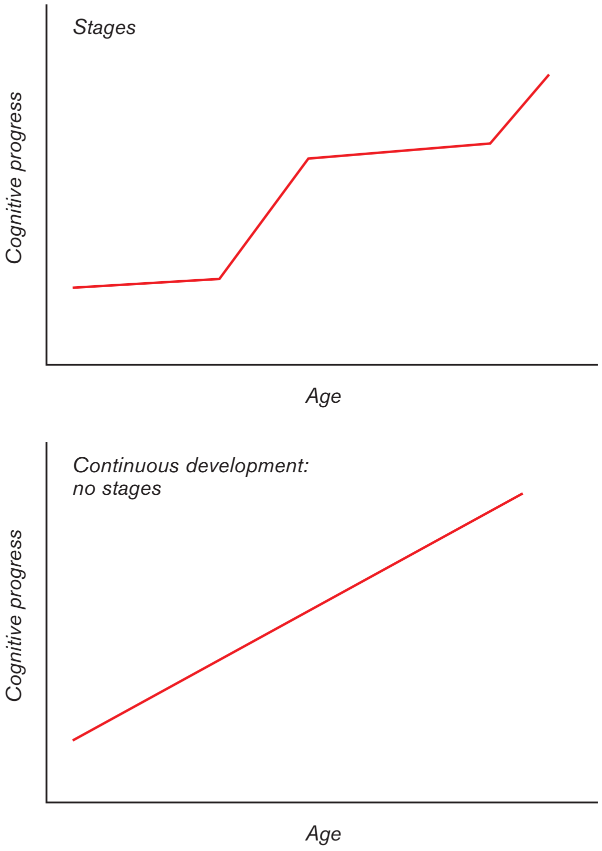


Figure 18.1 Stages or continuous development?

someone else retrieves the object at A (Butterworth, 1974; Landers, 1971).

All the research described so far involved infants making motor responses to discover where an object is located. A different approach was used by Wilcox et al. (1996) who showed 10-week-old to 6-month-old infants an object that disappeared at one location. The object then reappeared in the same location (regarded as a possible event) or at another nearby location (regarded as an impossible event). The infants looked longer at the impossible event, which suggests in these circumstances that they were not susceptible to the A not B error. The effect still occurred after 15 seconds' delay between disappearance and reappearance.

Diamond (1988) has suggested that the development of the frontal cortex is implicated in the A not B error. The frontal cortex is involved in the inhibition of typical or learned responses – a process known as executive functioning (see also page 296). Bell and Fox (1992) provide evidence consistent with this claim. They found that infants who were successful on tasks involved in sensorimotor substage 4 had more developed EEG patterns in the frontal cortex. However, after 50 years of research there is still no totally satisfactory explanation of Piaget's observations about the A not B error!

Self-test: List the explanations for the A not B error.

Challenges to Piaget's theory about sensorimotor development

Gibson (1966) is sometimes regarded as providing an alternative view to that of Piaget because of his suggestion that there is a rich array of perceptual information about the world and that infants have a capacity to make use of this information. Part of this process is direct perception, which involves immediate and automatic understanding (such as instantly knowing how far away an object is). In discussing these issues, Gibson emphasised the presence of innate perceptual abilities, but accepted that there will be some learning.

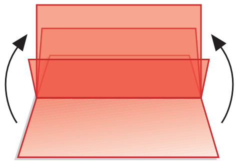
If infants directly perceive perceptual characteristics then one would expect them to show evidence of cross-modal integration. Cross-modal integration involves understanding the relationship between different senses – for example, knowing that there is a relation between a sound and the location of that sound. Several studies investigated whether newborn infants would turn in the direction of a sound, but these studies produced inconclusive findings. In a comprehensive study, Crassini and Broerse (1980) found that appropriate movements to the sounds occurred, but there were often failures to make responses due to the unpredictability of infant behaviour.

Another type of inter-modal perception involves touch and vision. Meltzoff and Borton (1979) allowed 4-week-old infants to suck for 90 seconds on dummies (pacifiers) that had either a plain or stippled surface. Then the infants were shown two objects. They looked longer at the object they had just sucked. Thus, both studies suggest that cross-modal integration occurs in young infants.

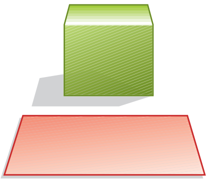
A study by Slater et al. (1990) indicates that newborns also exhibit the principles of size constancy. As things (e.g. a person on a bicycle) move away from us, their size on the retina in our eye decreases. However, we do not perceive the objects becoming smaller. Instead, we perceive them as remaining the same size.

Newborns were shown a cube six times and each time it was positioned at a different distance from the infant (habituation). The infant was then shown this cube and another one. The two cubes were positioned so that they both produced the same-sized image on the infant's retina and to do this the cubes were at different distances from the infant. If the perceptual system of infants does not take account of the distance of an object then both these cubes should be perceived as being the same. The infants preferred to look at the new cube. This suggests that even newborns possess size constancy and their visual system already is tuned in to take account of distance, not just retinal size.

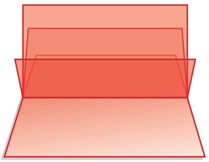
The infants at first see a rectangular screen that moves back and forth from a position lying flat in front of them, through a vertical position, to a position where the screen is lying flat away from them.



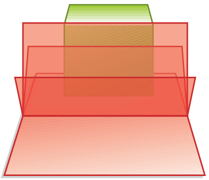
All the infants then see a box placed in the path of the screen.



Next, some infants see the box flattened by the screen.



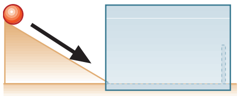
Other infants see the screen coming to rest on the box.



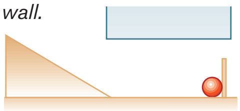
Which group of infants look longer at these two events?

Figure 18.2 Stimuli used by Baillargeon et al. (1985)

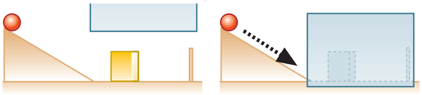
Infants see the following sequence a number of times. A ball rolls down a slope and behind a screen.



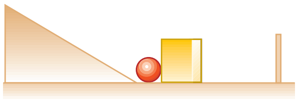
The screen is lifted to show the ball resting against a wall.



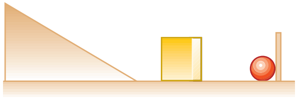
For all infants, a box is placed in the path of a ball and the screen is then lowered, and the ball rolls down the slope.



The infants then see one of two test events – either the ball resting against the box (possible)



or resting against the wall (impossible).



The looking time of the infants is recorded.

Figure 18.3 Stimuli used in the study by Spelke et al. (1992)

Another group of important investigations has concerned infants' visual attention and whether they look longer at events that violate physical laws. One of the first of these studies was conducted by Baillargeon et al. (1985). Five-month-old infants sat in front of a screen that was attached by a hinge to a table, rather like a drawbridge that could move through 180^0. This arrangement allowed the screen to lie flat in front of the infant, be raised to vertical and drop down to lie flat, 180^0 from its starting position (see Figure 18.2). The infants were allowed to habituate to the screen moving back and forth in this way. Then a cube was introduced into the sequence and infants saw one of two sets of events. They either saw the flap of the screen come to rest on a cube or saw the flap falling to the ground and by implication flattening the cube.

If infants have little or no understanding of the physical properties of objects one might expect them to pay more attention to the flap resting on the cube, because this is a different event from the habituation sequence. In fact, infants looked longer at the flap falling to the ground and appearing to squash the cube. This suggests that infants have an appreciation of the properties of objects and that objects should continue to exist and not simply disappear in these circumstances.

Later, Baillargeon (1987) demonstrated the same effect with 14-week-old infants and showed that 7-month-old infants appeared to expect the screen to stop sooner if the cube was larger or closer to the flap.

In another study, Spelke et al. (1992) familiarised 2½-month-old infants with the following sequence: a ball rolled down a slope, it went behind a screen and then the screen was lifted to show the ball against an end wall (see Figure 18.3). In the test trials, the infants saw a box placed in the path of the ball and then a screen was placed in position so they could see only the top of the box visible behind the screen. The screen was then lifted. Some infants saw the ball resting against a box, others saw the ball resting against the end wall. Infants looked longer at the ball against the end wall. Again, this study suggests that the infants could

FOCUS POINT 18.2

The stages of development identified in Piaget's theory

Pre-operational stage: two to six years

The beginning of this stage is marked by the use of symbolic representations. These allow children to use one thing to stand for another, such as words for objects or a banana to be treated as a telephone. This capacity makes humans very different from other species.

Piaget also identified two limitations of children's thinking during this stage, egocentrism and centration. The egocentrism that Piaget described was not deliberate selfishness, rather it involved the tendency to see the world from one's own point of view. A well-known study that describes this is Piaget's 'three mountains task'. As you can see from Figure 18.4, a child is seated in front of a table that has three model mountains placed on it. Piaget asked the children sitting at the table to choose a picture that showed what a doll, seated in a different position, could see. Children below six years usually chose the picture showing what they could see, not what could be seen from the position of the doll.

Centration refers to children focusing on one aspect of a task and ignoring others. For example, when children are asked which side of a balance scale (such as that shown in Figure 18.5) will go down, they tend to respond according to the number of weights on each side and ignore the effects of distance (Piaget and Inhelder, 1956).

Another task that Piaget used to show children's lack of conservation abilities involved setting out two rows of beads, each with the same number of beads, and the beads in each row matching the position of the beads in the other row. The experimenter would make sure that the children understood there was the same number of beads in each row. Then one of the rows of beads was extended to make it longer than the other row. Children were asked whether there were more beads in one row than in the other. Usually children younger than six would reply that there were more beads in the longer row. This was taken to show that the children were not able to conserve the number of items. The children appear to make a mistake due to centration, concentrating on only one aspect of the problem.

Concrete operations: seven to twelve years

At this stage children are less likely to be affected by egocentrism or centration. As a result they can understand reversibility (e.g. that volume and weight

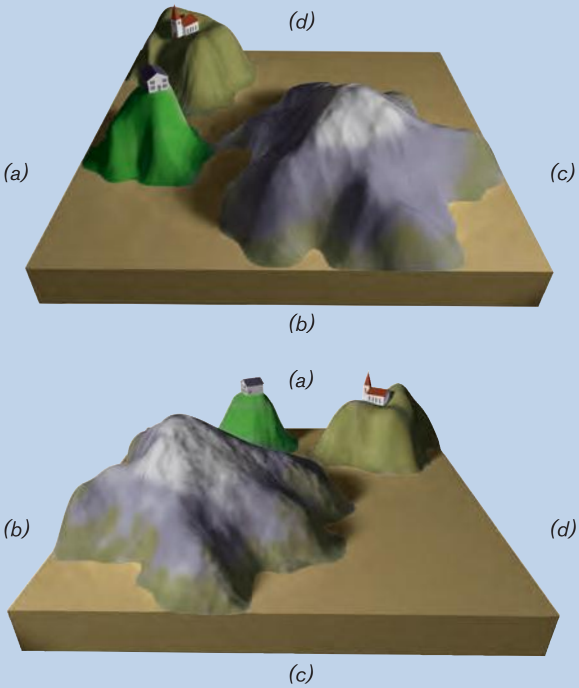


Figure 18.4 The three mountains problem: children can see one view of the mountains and have to decide what someone else (a doll in one test) can see from a different viewpoint

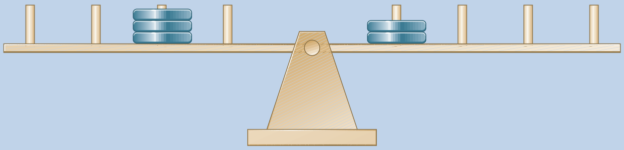


Figure 18.5 A balance scale

Present beakers A and B. Check that child agrees there is the same amount of water in each. Then pour water from B into C, and ask child whether there is the same amount of water in A and C.

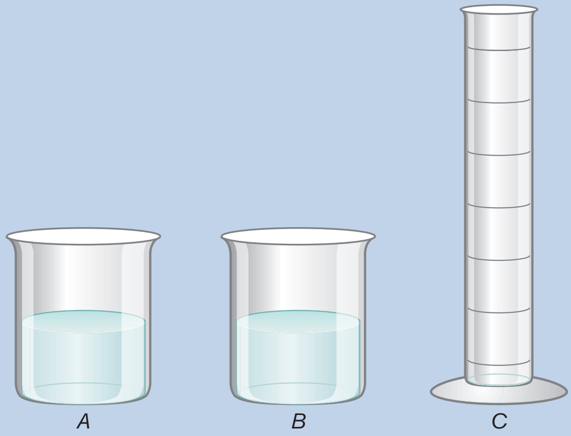


Figure 18.6 The conservation of liquid

FOCUS POINT 18.2 (CONTINUED)

remain the same despite being changed in shape). This enables children to be successful at conservation tasks; Figure 18.6 gives one of the best-known examples of this. However, children at this stage tend to be better at ‘concrete’ tasks that are tied to objects or events around them, rather than abstract tasks. An example of a concrete task is: if James is bigger than Adam, and Adam is bigger than John, is James bigger than John? An example of an abstract task is: if A is greater than B, and B greater than C, is A greater or less than C?

Formal operations: twelve years and over

This stage involves the ability to think abstractly, hypothetically and systematically, but it is a stage that is not necessarily reached by everyone. An example of this form of thinking occurs in the task of identifying the variables that influence the length of swing of a pendulum. Children tend to evaluate in an unsystematic manner variables like weight of pendulum, length of string and the force used to push the pendulum. In other words, they fail to study the effect of changing one of the variables while holding the others constant.

In contrast, systematic strategies are adopted by individuals at the formal operations stage. Thus, formal operations involve the principles of scientific thinking, especially the development and systematic testing of hypotheses.

RESEARCH METHODS BOX 18.1

Getting the best from children

A group of investigators working in Edinburgh devised a series of clever studies which showed, when given the appropriate circumstances, that children could perform better than Piaget had predicted. One of these is a version of the three mountains task. It involved a model brick wall built in the shape of a cross, a model robber and two policemen. The children were asked to place the robber so that he could not be seen by the two policemen (See Figure 18.7).

Children as young as 45 months could successfully accomplish this task; to be able to do this involves the ability to understand what the policemen could see. Hughes and Donaldson (1979) argued that these young children could accomplish this task because it was like a hide-and-seek game and so was a familiar problem to them.

The usual design of conservation experiments is that the experimenter asks a question (e.g. ‘Are there the same number of beads in both rows?’), something is done to the materials and then the experimenter asks the question again. McGarrigle and Donaldson (1974) pointed out that the repetition of questions to children often occurs when the first answer is incorrect, and the implication is that the child should give a different answer (see Rose and Blank, 1974).

For these reasons McGarrigle and Donaldson had a character called ‘naughty teddy’ who muddled up the test material. As a result, in the conservation of number task, naughty teddy would make one row of beads longer than the other. In these circumstances, about 80 per cent of children aged between four and six years gave the correct answer to the conservation problem. McGarrigle and Donaldson argued that the actions of naughty teddy provide a much more reasonable case to ask the same question again and, as a result, children may not feel they had to change their answers.

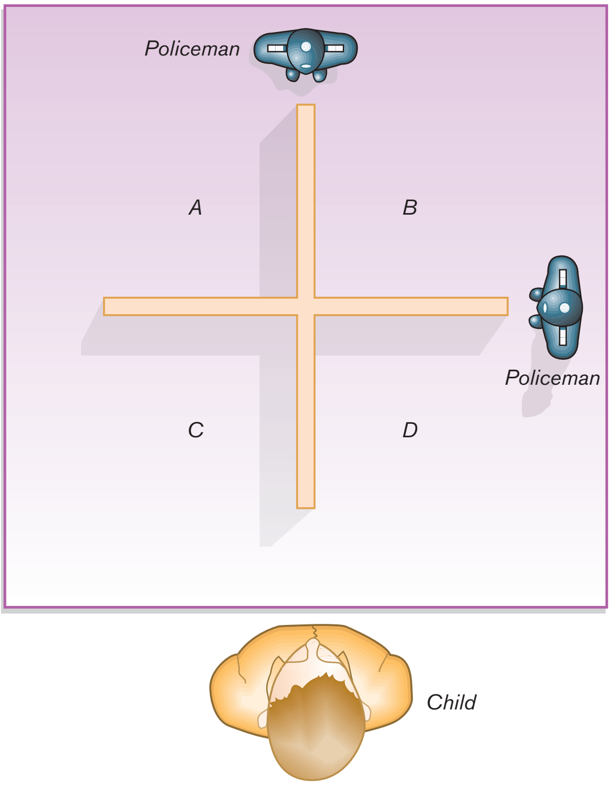


Figure 18.7 The ‘hiding a robber from the policeman’ task

distinguish between possible and impossible physical events and paid more attention to the impossible events.

All these studies suggest that infants have expectations about some of the important physical characteristics of their environment. Furthermore, it seems unlikely that infants as young as this could have discovered these properties by acting on the environment using the cognitive processes suggested by Piaget. However, more recently, there has been discussion about the reason for the disparity between the findings about infant abilities in studies where they act on an object (e.g. object permanence) and in those where their attention to surprising events is assessed. The studies of attention appear to show that infants have abilities that are not demonstrated in their actions until a number of months later (see Bremner, 1999; Hood, 2003). For example, the studies of visual attention suggest that before the age of 6 months infants have an awareness of object permanence. However, studies of infants' actions when they uncover an object that is hidden indicate that success only occurs a number of months later. Thus different methods give us different findings about infant capabilities. One explanation for this difference is that actions increase the cognitive demands placed on infants, with the result that they are much more likely to be unsuccessful in these tasks (e.g. planning, retaining information in short-term memory).

Self-test: What criticisms have been made about Piaget's ideas concerning early cognitive development?

Cognitive development: preschool to adolescence

Piaget's theory of cognitive development has also had a profound effect on the study of children in the preschool and the school-aged years (see Focus point 18.2).

Evaluation of Piaget's ideas

One criticism of Piaget's work has been his general lack of appreciation of the way that social processes affect development. However, it is inaccurate to say that he did not consider social processes. A number of his studies into children of school age were concerned with the way that discussions involving peer interaction could be more beneficial than discussions with adults. He supposed that children would accept the accuracy of adult viewpoints without any accommodation of their schemata. Another criticism is that Piaget did not fully appreciate that many of the abstract tasks he gave children could make it difficult for them to work out the correct answer and the way that children were asked questions could undermine their confidence in their own answers (see Research methods box 18.1).

Despite these criticisms and despite the fact that research has moved beyond the issues Piaget identified, he still remains the most important figure in developmental psychology. One of his most significant legacies has been the emphasis given to constructivist views about development, the assumption that knowledge is gradually acquired by building up an understanding of the world and that this occurs through interaction with the world. His influence also is due to the breadth of his writings across a range of ages and a range of cognitive processes. Another factor that contributed to his impact was the way he identified differences between children's and adults' thinking and was able to demonstrate these differences by obtaining simple but dramatic findings. Piaget's work has had a profound influence on early education and has resulted in emphasis being given to so-called discovery play, where children find out about the properties of objects through their own exploration and efforts.

Self-test:

- What methodological criticisms can be made of Piaget's studies?
- Name and outline Piaget's four stages of cognitive development.

Moral judgements: thinking about social situations

Piaget's findings about children's rules and judgements provided an important starting point for the study of moral judgements. This topic concerns the way that children

RESEARCH METHODS BOX 18.2

The hypothetical dilemma, 'Joe and his father'

Read through the following hypothetical dilemma that Colby and Kohlberg (1987: 3) set their participants. There are some questions that go with it and you will be asked to answer these yourself in Activity Box 18.3.

Joe is a 14-year-old boy who wants to go to camp very much. His father promises him he can go if he saves up the money for it himself. So Joe works hard at his paper route and saves up the $100 it costs to go to camp and a little more besides. But just before camp is going to start, his father changes his mind. Some of his friends have decided to go on a special fishing trip, and Joe's father is short of the money it will cost. So he tells Joe to give him the money he has saved from the paper route. Joe doesn't want to give up going to camp, so he thinks of refusing to give his father the money.

1. Should Joe refuse to give his father the money? Why? Why not?
2. Does Joe's father have the right to tell Joe to give him the money? Why? Why not?
3. In general, why should a promise be kept?
4. In general, what should be the authority of a father over his son?
5. What do you think is the most important thing a son should be concerned about in his relationship with his father?

ACTIVITY BOX 18.3

Kohlberg's stages of development of moral judgement

Note down your answers to the questions in Research methods box 18.2 and then try to see where you fit in the stages below.

LEVEL AND STAGE	WHAT IS RIGHT?
LEVEL I PRECONVENTIONAL	
Stage 1 Heteronomous morality	■ Adherence to rules backed by punishment; obedience for its own sake
Stage 2 Individualism, instrumental purpose and exchange	■ Acting to meet one's own interests and needs, and letting others do the same
LEVEL II CONVENTIONAL	
Stage 3 Mutual interpersonal expectations, relationships and interpersonal conformity	■ Living up to what others expect
Stage 4 Social system and conscience	■ Fulfilling the actual duties to which one has agreed ■ Upholding laws except in extreme cases when they conflict with other fixed social duties ■ Contributing to a society, group or institution
LEVEL III POSTCONVENTIONAL OR PRINCIPLED	
Stage 5 A social-contract orientation, generally with legalistic and utilitarian overtones	■ Being aware that people hold a variety of values and opinions; these are often relative to the group that holds them ■ Upholding rules in the interests of impartiality and because they are the social contract ■ Non-relative values and rights, such as life and liberty, must be upheld in any society, regardless of majority opinion
Stage 6 Universal ethical principles	■ Following self-chosen universal principles of justice: the equality of human rights and respect for dignity ■ Judging laws in relation to these principles ■ When laws violate principles, acting in accordance with the principle

develop the ability to decide about the appropriateness of their own actions and those of others; this is usually distinguished from the study of moral behaviour, which concerns the actual actions that children and adults carry out. As one would expect, there is usually a reasonably close relationship between moral judgements (thinking) and moral behaviour (actions), but it is not a perfect one.

Piaget's (1932) investigations of children's rules provided a starting point for the study of moral judgements. His first studies concerned boys playing marbles and girls playing hide-and-seek. The conclusions he drew were based on watching children play the games, playing the games with them and pretending to be ignorant of the rules, asking children about rules and asking children where the rules came from.

Piaget claimed that in the first stage, which occurs before 3 years of age, children do not understand rules. At the second stage, between 3 and 10 years, children believe that rules come from a higher authority, such as parents or God. In the third stage, children realise that rules can be negotiated between people and that rules can be changed by agreement. This distinction between stages 2 and 3 is sometimes referred to as a distinction between heteronomous and autonomous morality. The former involves obeying authority, the latter involves individual decisions. These findings were broadly confirmed by Linaza (1984) in a study of English and Spanish children.

Another important study of Piaget's (1932) involved telling children two related imaginary stories that involved a moral comparison. The pairs of stories were made to differ so that the children could express their views about these differences. For example, one pair of stories concerned a boy who accidentally broke 15 cups, and another who broke one cup when trying to get some jam while his mother was out. Children were asked to say which child was the naughtiest. Up to 9 or 10 years, children often made judgements which took into account only the intentions or the consequences. The average age for focussing on consequences (moral realism) was 7 years, and for focussing on intentions (moral subjectivism) was 9 years.

These studies were conducted at an early stage in Piaget's career when psychological methodology was not well established. Have you spotted the problems with these studies? One criticism (see Turiel, 1998) is that they do not systematically investigate one variable at a time (the story above involves different intentions and different amount of damage) and the situations used in the two stories were different. Thus it would have been better if Piaget had counterbalanced the content of the stories, so that one story had accidental damage to 15 cups on half the occasions and accidental damage to one cup on half the occasions.

Moral dilemma stories were used by Kohlberg in his extensive research on this subject (see Research methods box 18.2).

In the 1950s Kohlberg started a longitudinal study of 50 males who were seen every 3 years and eventually he had information on a sample of people whose age spanned between 10 and 36 years. Kohlberg identified three stages of moral reasoning, each of which was subdivided into two further stages. The stages are given in the table in Activity box 18.3.

Kohlberg's proposals have had a substantial impact on the study of moral reasoning. Even so, a number of criticisms have been levelled at his methodology and conclusions. For example, Kurtines and Greif (1974) argued that the stories had been selected on an intuitive basis and that the way answers across stories were coded was not always consistent. Damon (1977) raised the issue of the stories having different meanings to different-aged individuals: think about the way the story in Research methods box 18.2 might affect a 6-year-old and a 15-year-old. Damon devised alternative proposals that assessed the idea of positive justice, involving principles such as sharing, fairness and distributive justice.

Another type of criticism was made by Gilligan (1982). She argued that because Kohlberg's initial sample was all male, his stages reflected a male bias, particularly at the higher end of the scale. She suggested that female morality was based more on issues of responsibility to others than on justice. This was supported by findings from females who were attending an abortion and pregnancy counselling service.

Kohlberg and Colby revised the assessment procedures to take account of some of these criticisms (Colby and Kohlberg, 1987). The new system was applied to the original data: it reduced the number of individuals who were at stage 5 and no one was identified at stage 6 (Colby et al., 1983).

Despite the research of Kohlberg being based on a North American sample, the sequence of stages has for the most part been found to exist in other societies. In a review of 27 cross-cultural studies, Snarey (1985) concluded that most found evidence of stages 1–4, but stage 5 was rare, suggesting that higher levels of moral reasoning may be related to cultural values.

Self-test: What criticisms have been made of Kohlberg's theory?

Information and representations

Kohlberg's study of moral judgements adopted a developmental model similar to that used by Piaget. Other approaches to cognitive development provide a greater contrast and we now turn to these. Piaget saw cognitive development as involving the assimilation of stimuli and the accommodation of schema. These are general mechanisms and, as a result, it is difficult to break cognitive development into identifiable components. This is made even more difficult because accommodation and assimilation are supposed to occur at the same time. An important body of more recent research has been concerned with the changes in the way that information is coded and processed. The following two sections concern theories about information processing and about representations.

Information-processing theories

According to this approach, cognitive development occurs because information is processed in more effective ways over the course of development, new aspects of a problem are noticed, new strategies are developed and/or greater information processing capacity brought to bear on a task. The suggestions made by Brainerd (1983) illustrate the way that information processing involves much more specific

FOCUS POINT 18.3

Children's memory

Several aspects of children's memory have been studied. Memory span is assessed by giving random sets of items (usually letters or digits) to children and seeing how many are recalled. Four-and five-year-olds can usually recall four digits; most nine- and ten-year-olds can remember six (Siegler, 1996).

Case (1995) has suggested that this change might be due to older children being able to process information more quickly and, as a result, they can encode, store and retrieve more items. In particular, older children can say words faster than younger children, and this may help them by allowing more items to be rehearsed in short-term memory (Case et al., 1982).

It also seems that increasing knowledge about a topic enables children to process and remember information more successfully. A study by Chi (1978) compared the ability of college students and children to memorise the arrangement of pieces on a chessboard. The children were better at the task than the students. The children were chess experts and the students were chess amateurs. However, the students were better than the children at recalling a random set of numbers.

Research has also been conducted into children's accuracy as eyewitnesses. Varendonck (1911), in the first study of this topic, concluded that children were too suggestible to be witnesses. More recent research on eyewitness experiences has revealed that children produce only a limited amount of information in free-recall settings and the amount increases with age (Martin et al., 1979). Furthermore, when given objective questions (i.e. ones that did not suggest a particular answer) six-year-olds were as accurate as older children and adults. However, when children are given leading questions ('He had blonde hair, didn't he?') they are more likely than adults to give the answer implied by the question (Goodman and Reed, 1986).

In addition, Leichtman and Ceci (1995) have shown that if three- and six-year-olds are repeatedly given misleading information when questioned, they eventually seem to incorporate this information into their memories. Thus they are accurate at the immediate recall of information, but after being given misleading questions on a number of occasions they report the misleading information as fact.

Research into memory has also concerned metamemory. This involves knowledge about memory itself. Flavell et al. (1970) report that eight-year-olds are much better than five-year-olds at judging whether they would be able to remember a set of ten pictures. In addition, the five-year-olds said they were ready to be tested before they had taken sufficient time to study the pictures.

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aspects of cognition than Piaget's more general ideas about development.

Brainerd supposed that 'encoding limitations' could result in children failing to notice and process information. For example, in the balance scale shown in Figure 18.5, some children notice the number of weights on each side but cannot remember the position of the weights. Interestingly, this is similar to Piaget's ideas of centration, where children attend only to certain aspects of a problem.

Brainerd also suggested that computational limitations occur when there is an absence of appropriate strategies. For example, when predicting whether a balance scale will balance, this might incorrectly involve simply adding up the weights on each side and predicting that the side with most weights will go down. There also could be retrieval limitations, when children have the appropriate strategy (among others) in long-term memory, but retrieve the incorrect one – for example, dividing when the appropriate strategy would be multiplying.

A further type of difficulty could arise because of storage and cognitive workspace limitations. These occur when children forget information or there is too much information for them to process (see Focus point 18.3).

A good example of the information processing approach is Siegler's work on the balance scale (see Figure 18.5). Children were given different arrangements of weights on the rods and were asked whether the beam would stay level or would go down to the right or to the left. What do you think would happen to the scale shown in the figure?

Siegler varied the arrangements of weights to help him understand the principles behind children's answers. This involved task analysis to identify the variables that govern the balancing of the scale; in this case weight, distance and the multiplication of these two variables can be used to make predictions. From the children's answers he identified four 'rules' that they follow when giving their answer. These rules give an idea of children's understanding of the problem (see Figure 18.8).

Siegler also conducted a series of studies to identify what brought about the change in the rules. He found that the youngest children who were adopting rule 1 did not encode (i.e. pay attention and process) information about distance. Siegler briefly showed children a balance scale with an arrangement of weights on it. He then took the scale away and asked the children to reproduce what they had seen on another balance scale using another collection of weights.

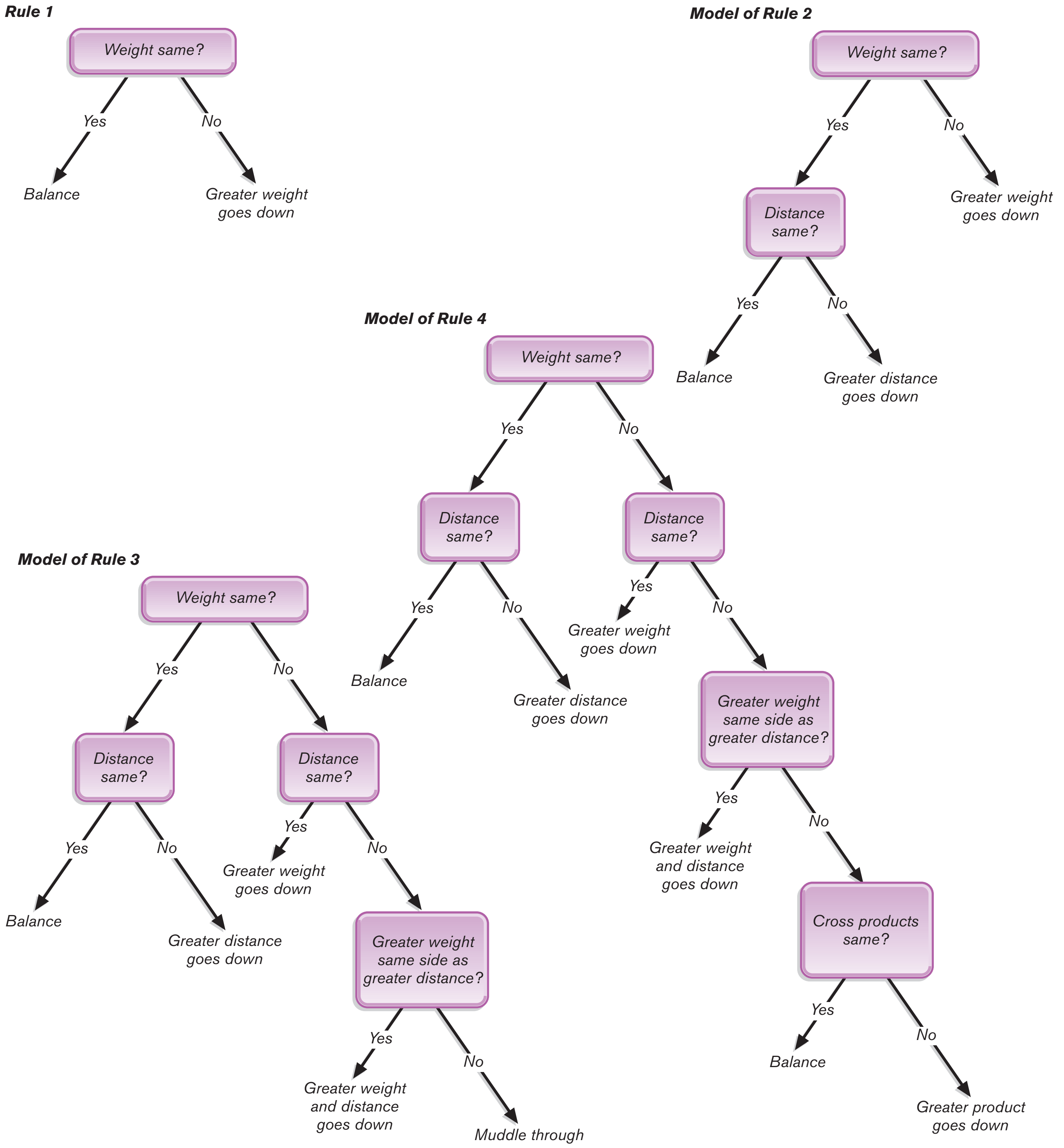
Rule 1
Weight same?
Yes
No
Balance
Greater weight goes down
Model of Rule 2
Weight same?
Yes
No
Distance same?
Greater weight goes down
Yes
No
Balance
Greater distance goes down
Model of Rule 4
Weight same?
Yes
No
Distance same?
Distance same?
Yes
No
Yes
No
Balance
Greater distance goes down
Greater weight goes down
Greater weight same side as greater distance?
Yes
No
Greater weight and distance goes down
Cross products same?
Yes
No
Balance
Greater product goes down
Model of Rule 3
Weight same?
Yes
No
Distance same?
Distance same?
Yes
No
Yes
No
Balance
Greater distance goes down
Greater weight goes down
Greater weight same side as greater distance?
Yes
No
Greater weight and distance goes down
Muddle through

Figure 18.8 Rules and balancing

Five-year-olds tended to remember the correct number of weights, but they often positioned them on the wrong rod, while 8-year-olds were more accurate in remembering the number of weights and their position. The performance of young children was improved by asking them to count the number of weights on each rod. This also resulted in almost all the younger children, when later given the prediction task, using a rule that was more advanced than rule 1.

An issue facing information-processing theories concerns the developmental changes that allow children to become better at information processing. One possibility is that there is a general increase in capacity – for example, more items can be stored in memory or that information can be processed more quickly (Kail, 1990). Another possibility is that children become more efficient at coding information so that they can deal with more information at any one time (Case, 1985). Case described a set of stages based on children's information processing abilities. This has been described as a 'neo-Piagetian' approach because it uses new ideas to describe development in terms of stages.

More recent work by Siegler and his colleagues has developed what he has termed the overlapping waves theory (Siegler, 1996). This supposes that children when attempting to solve a problem use a variety of strategies and that eventually the most successful strategy will 'win' and become the predominant one. This can be seen in a study of addition conducted by Siegler and Jenkins (1989). They focused on what has been termed the min strategy. For a problem like adding up 2 and 5, the min strategy involves identifying the larger number and simply counting up from that to give the answer (e.g. $5 + 1 = 6$; $6 + 1 = 7$).

The investigators studied eight children aged between 4 and 5, who did not yet use this strategy. The children were given these problems three times a week for 8 weeks. This is termed a microgenetic study because there was an intense period of data collection over a comparatively short space of time. From video records and interviews it was apparent that the children used several strategies. It had been assumed that children would count up from either number they were given and then start to realise that it is more efficient to count up from the larger of the two numbers. However, this does not seem to have been the case. What was discovered was that, when adding 2 and 5, children would use a strategy of simply counting from 1 up to 7 to obtain the correct answer. When they had used this strategy only a few times they then started to use the min strategy. Interestingly, the min strategy was adopted more quickly when the children were given problems like $20 + 2$, where the min strategy is especially effective.

The information-processing approach has provided important insights into the development of children's thinking. By focusing on the way children overcome their limitations in the way they process information, we have gained a better understanding of the changes in their reasoning and the best ways to assist their development. However, it has been difficult to go beyond the descriptions of the information processing in specific tasks to construct more general models of cognitive development.

Self-test: List the differences between the information-processing approach to cognitive development and Piaget's theory of cognitive development.

The nature of representations

Information-processing theories tend to assume that all stimuli are processed in similar ways. However, a feature of human thinking is that we have different types of representation. Bruner's (1966) ideas about representations provide a good example of this. He described three modes of representing the world, enactive, iconic and symbolic. Enactive representations involve actions and experiences (similar to Piaget's sensorimotor stage). These representations can occur at all ages and involve automatic patterns of motor activity such as typing and riding a bicycle. Iconic representations involve images; these first occur around 12–18 months. At around 6 to 7 years, Bruner suggested, there is a change to the symbolic mode. This enables children to deal with logical relations and reversibility.

More recently, increasing interest has been shown by psychologists in thinking that involves non-consciousness processes. Studies of adults have often drawn a distinction between implicit and explicit knowledge. An example of implicit knowledge is children's use of language: children usually follow the rules of grammar, but if you ask them how they do this or why a particular sentence is correct then they (and many adults) cannot give an explanation.

In addition, there are examples of learning taking place without conscious awareness. Reber (1967) gave adults long sequences of letters, which unknown to them involved certain sequences being more likely than others (e.g. J usually follows X). When they were asked to predict which letter occurs next there was evidence of implicit knowledge. The adults often gave the correct answer, but were not aware that they had learnt something about the sequence of letters – they thought they were just 'guessing'.

In contrast, other forms of knowledge are explicit: a person can explain the rules of chess or how to reach a place they know. In these cases, the knowledge about the answer is accessible and can be put into a verbal form.

There is also work on children's speech and gestures, which suggests that children have different representations underlying these two forms of communication. McNeill (1992) described the way that gestures are often iconic – this means that one can understand their meaning from the form of the action. For example, children will use appropriate sideways movements of their hands when talking about width and vertical movements to indicate height in conservation tasks (Church and Goldin-Meadow, 1986).

However, on occasions there is discrepancy between speech and gesture (Alibali and Goldin-Meadow, 1993). These children seem to be in a state of readiness to learn and this may be because their nonverbal representations are more advanced than their performance or verbal reports. Research findings show that children who exhibit this discrepancy are more likely to benefit from instruction in conservation tasks, mathematics and balancing tasks (Pine et al., 2004).

Karmiloff-Smith (1992) in her representational redescription (RR) model has drawn attention to the way that cognitive development involves a progression from implicit, non-conscious representations to explicit representations that can be put into words. Thus, her concern is about the way that thinking becomes more sophisticated in terms of higher levels of awareness about our own thought processes. The term representational redescription captures the idea that cognitive development involves simple representation being changed into more sophisticated forms of representation that are easier to access and that, eventually, can be expressed through language.

Karmiloff-Smith rejects the idea that development involves a series of stages as claimed by Piaget. Instead, she proposes that different levels of development occur within particular domains, so that children can be at one level for, say, spelling and at another for balancing. This is why she uses the term level rather than stage. She also rejects the idea that at birth there are modular systems so that some forms of thinking are separate from other cognitive processes (e.g. that language is a separate modular system). Instead, she believes that modules are the result of development bringing about specialised cognitive processing. Thus a language module could develop as a result of the time spent in listening and talking.

One of the tasks she used to study cognitive development involved the balance beam (see Figure 18.9), where a wooden rod-like beam is balanced on a fulcrum. Some beams are symmetrical and have the same number of small blocks of wood stuck to both ends of the beam. As a result, the beams balance in their geometric centre. Other beams are asymmetrical and have a different number of small blocks of wood at each end of the beam. As a result, these beams do not balance in the geometric centre.

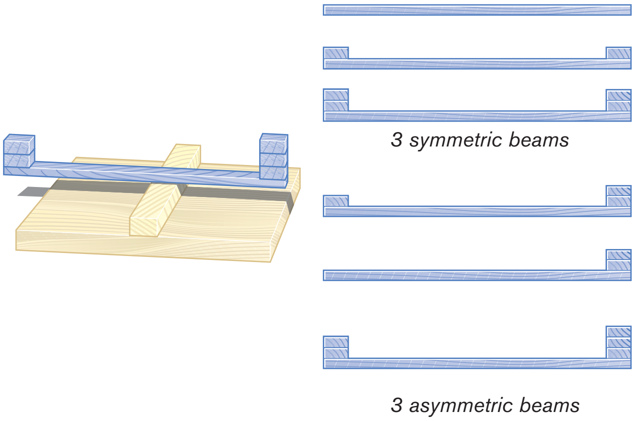

Figure 18.9 Balance beam

Karmiloff-Smith suggested that children start with an implicit level of representation. On the balance beam task, these children can balance both symmetrical and asymmetrical beams. However, if the experimenter asks them how they achieve this, they will say they 'don't know', they might try to show by gestures how they balanced a beam or they might give a spurious explanation such as 'I balanced it where that bit of paint is' (Pine and Messer, 2003). Karmiloff-Smith believes that, at this level, children do not have any unified strategy or theory about balancing, but solve each problem by trial and error.

At the next level, children start to use a general strategy to solve problems, but still cannot explain their own behaviour. In the case of the balance beam, they try to balance all the beams at their geometric centre. This is successful with symmetrical beams, but results in failure with asymmetrical beams. Consequently, although children are making cognitive progress, because they have adopted a general strategy, their performance actually declines. This dip in success rates is often termed a u-shaped curve. Pine and Messer (2000) have termed this the abstraction level because children seem to have 'abstracted' a strategy that often, but not always, results in success.

Karmiloff-Smith believes children at this level do not yet have conscious access to their representations. As a result, they are not aware of their strategy or able to explain it. However, their strategy has a powerful effect on their behaviour. Children at this level will deny that an asymmetrical beam can be balanced and unlike children at other levels, they are less likely to make gains from seeing an experimenter balancing asymmetrical (Messer and Pine, 2000).

Karmiloff-Smith also argues that there might be a further level where children *do* have conscious access to their representations, but are not able to explain what they know. She terms this level E2. This seems to correspond to being able to make predictions about whether a beam will balance, but not being able to explain the prediction. The final level identified is the explicit level. At this level, children are able to explain their success in terms of weight and distance and are also able, once again, to balance both symmetrical and asymmetrical beams.

Investigations conducted by Pine and Messer using balance beam tasks have provided support for the general features of the representational redescription theory. In a microgenetic study (which involves detailed observations over a short period) children were seen on five successive days. Almost all the children showed progress to higher levels of representation and only a very small number of children showed regressions to lower levels. Furthermore, the children showed a gradual progress through the levels. Their progress did not involve jumps from implicit to explicit levels, something that might be expected if the change merely involved working out how to verbally explain something (Pine and Messer, 2003).

Another important finding was that the level of representation in the balance beam task was not related to children's vocabulary size, so that the levels did not seem to be simply the result of better language abilities (Messer and Pine, 2000). Furthermore, Pine and Messer found that children who were at the abstraction level had the most difficulty in making progress. It seemed as if having a strategy that is difficult to put into words makes further progress more difficult.

The study of implicit and explicit representations shows that cognitive development can involve a progression from implicit levels where success occurs but children are unable to explain this success, to abstraction levels where there is an inappropriate strategy and the success rate is lower and then to the explicit level where there is success and the ability to explain why the success has been achieved. Thus limitations in children's cognitive operations occur because the underlying representations are difficult to integrate or access.

In contrast, Piaget saw limitations of children's cognitive operations as occurring because of inappropriate assumptions (e.g. object permanence) or failure to process all the information that was available (e.g. centration). Information-processing theories have tended to treat all cognitive operations as involving the same type of cognitive representations so that cognitive development occurs because of increases in processing capacity.

ACTIVITY BOX 18.4

Journals: reading and reporting

Ask two or three students or groups of students to prepare a presentation about a research paper to summarise the main points of the article in about 10 minutes (either recommended or their choice – could be linked to cognitive development). It is useful to explain that this can be quite a difficult task, but is good preparation for later studying. Have all students in the group read the articles. After each presentation encourage discussion of what are the main points of the article and give help with understanding the structure and format of journal publications.

Suggested papers that illustrate some of the classic designs used to investigate child development:

Cairns, P. & Jarrold, C. (25) Exploring the correlates of impaired non-word repetition in Down syndrome. *British Journal of Developmental Psychology*, 23, 401–416.

Nation, K., Marshall, C.M. & Snowling, M.J. (2001) Phonological and semantic contributions to children's picture naming skill: Evidence from children with developmental reading disorders. *Language and Cognitive Processes*, 16 (2/3), 241–259.

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Self-test: What is the difference between theories concerned with information processing and theories concerned with representations?

Social processes and cognitive development

Vygotsky: bringing cultural, social and cognitive processes together

A general criticism of many cognitive theories of development is that social processes are largely ignored and for humans it is possible to argue that learning in social settings rather than individual voyages of discovery are responsible for many of the abilities we have. Lev Vygotsky is seen by many as being the first psychologist to discuss and theorise extensively about the role of speech, social settings and culture (see Focus point 18.4) in relation to cognitive development.

In many ways, Vygotsky's contribution to developmental psychology is difficult to pin down. Unlike Piaget, he did not produce a detailed model of development through the lifespan. Despite this, it is possible to argue that his views have a more direct relevance to contemporary research than those of Piaget. Part of the reason for this is Vygotsky's preoccupation with children's participation in social and culturally based activities as the primary means of extending their capabilities. For example, the way children think about the world around them and the issue of causation can be influenced by the religious and scientific beliefs of a culture (e.g. believing that the world is flat). This is different from the way that Piaget portrayed the

FOCUS POINT 18.4

Vygotsky

Vygotsky (1896–1934) grew up in Tsarist Russia and his research work was carried out under the repressive communist regime of Stalin, in a context where there was considerable personal danger associated with having independent and challenging views. The predominant view during the 1930s and 1940s in both communist Russia and the West was to put consciousness and the complexities of social processes beyond the remit of psychological investigations. Vygotsky's work only became widely known in the West through translations made available in the 1960s and 1970s.

independent scientific thinking of the formal operations stage, where the highest level of thought involves a scientific approach.

Vygotsky was concerned with the relationship between thought, language and consciousness. Part of this concern involved an interest in private speech; this occurs when young children talk to themselves in an apparent effort to help themselves think and reason. Children's use of private speech provided a basis for suggesting that language enables thought and language to be integrated in the reasoning process. Vygostky also made the point that language allows reflection and restructuring of one's own thought processes.

Vygotsky also highlighted the way children learn from others who are more knowledgeable than themselves. This idea has had a considerable impact and has been taken up with the use of the term zone of proximal development (ZPD) (see Figure 18.10). The activities a child can accomplish alone form the first 'zone'. Beyond this is the ZPD; in this zone children can accomplish things with partial help from others (e.g. a 1-month-old baby appearing to engage in taking turns in a 'conversation' because the adult carefully inserts their speech between infant vocalisations). Beyond the ZPD are activities that a child will find difficult to accomplish even with assistance (e.g. trying to teach a 1-month-old baby to talk). The importance of the ZPD is that, through social interaction, individuals with more advanced abilities can help children make cognitive developments by supporting their learning processes.

These ideas have had an impact on the way teachers try to extend pupils' own ideas and abilities and has emphasised the way that this can be achieved in social settings. A good example of this is the idea of scaffolding proposed by Wood et al. (1976). They observed mothers and children jointly attempting to solve the problem of building a pyramid made from blocks. The most effective mothers were those who anticipated the difficulties of their child. Wood et al. describe a number of processes that contribute to effective scaffolding.

It might help to imagine these in relation to helping a young child solve a jigsaw puzzle. The strategies include the recruitment and maintenance of a child's interest and motivation in a task by, for example, pointing out where to look and by offering encouragement. Another strategy is modelling to show a child what to do – for example, putting some jigsaw pieces together and then undoing them again. Adults can simplify the task by reducing the number of possibilities: an adult might give one jigsaw piece to a child that will fit in part of the already constructed jigsaw. During scaffolding, adults also highlight critical features of the task when an incorrect attempt is made or when an insightful action is accomplished. What is seen as important in effective scaffolding is matching the level of assistance to the children's capabilities, so the help puts children in a position to accomplish something they would be unable to do by themselves.

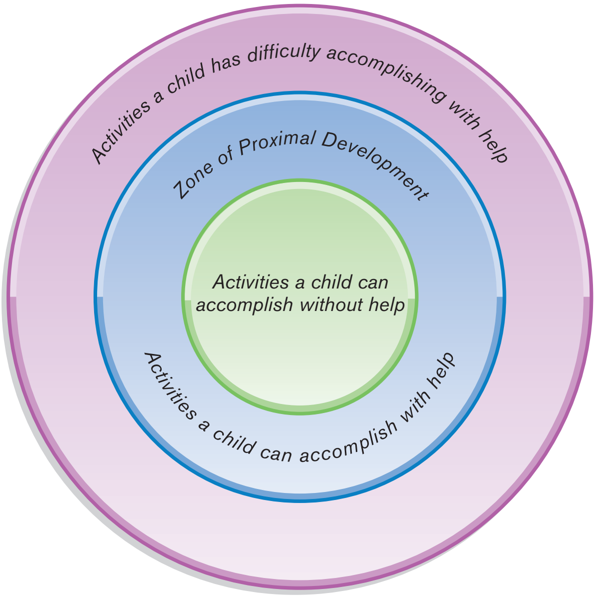
Activities a child has difficulty accomplishing with help
Zone of Proximal Development
Activities a child can accomplish without help
Activities a child can accomplish with help

Figure 18.10 The zone of proximal development (ZPD)

A related idea is that of guided participation, where adults model, guide and regulate the activities of children (Rogoff, 1990). The difference between this and scaffolding involves the emphasis given to the acquisition of particular activities of a culture. Rogoff et al. (1995) identified three levels of analysis. These involved the community plane (people interacting in culturally organised activities such as education); the interpersonal plane (the actual interaction between people) and the personal plane (the way children change through their engagement in the activity).

There is also a body of research about the beneficial effects of group collaboration on children's learning (e.g. Doise and Mugny, 1984). On the whole, children have been shown to learn more if they work together with a group of peers than if they solve problems individually (see Joiner et al., 2000).

However, simply putting children together is no guarantee of improvement and several factors have been identified that mediate the facilitative effects. These include the relative competence of the children, the presence or absence of feedback, task design (Howe et al., 1995), the role of modelling, friendship patterns and the degree of active participation (see Messer and Pine, 2000).

Cultural psychology as applied to child development has drawn on many of these ideas. Crook (1999) has identified three concerns of cultural psychology within a developmental context. The first is the way that individual human activities and development are mediated by objects or organisations that have been created as part of human culture (i.e. cultural tools). These can be simple objects, such as a spoon or complex organisations like the internet. These cultural tools make humans and human development different from that of most animals who act directly on their environment; instead, human actions take place in a cultural environment that has been created by humans. Adults assist children in using cultural tools and, by using the cultural tools, children change their own skills and thinking.

The second concern is about the importance of interpersonal experience to human development. Interpersonal experiences allow personal meanings and views to be negotiated and changed during the process of interaction. Such experiences can involve the development of a whole range of ideas. These might include the views a person has of him/herself. The third concern is about the importance of ecological settings: the precise way that social and physical settings influence the development of children.

Thus, the sociocultural perspective emphasises the way that children are influenced by and influence their cultural settings – for example, the widespread use of computer games can be seen as the result of a complex set of influences that involve technical innovation, children's interests and changes in family structure, as well as the wider values and organisation of the culture.

Self-test: Give examples of the way in which social and cultural processes can help the development of children's thinking.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe and discuss Piaget's ideas about cognitive development in infancy.
2. Describe and discuss Piaget's ideas about pre-operational and concrete operational thinking.
3. Evaluate the information processing explanation of cognitive development.
4. Describe the differences between the information processing and representational accounts of children's development.
5. Discuss the contribution of social and cultural processes to cognitive development.

Further reading

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Slater, A. and Lewis, M. (eds) (2007) *Introduction to Infant Development*, 2nd edn. Oxford: Oxford University Press.

Wood, D. (1998) *How Children Think and Learn*. Oxford: Blackwell.

Essay titles and references

1. Discuss the strengths and limitations of Piaget's theory of development.

   This question can be answered by reading a range of sources, the topic is covered in many textbooks on developmental psychology and there are numerous web pages. A particularly good overview is Donaldson, M. (1978) *Children's Minds*. London: Fontana Collins. It is still easily available and still relevant.

2. Are infants pre-programmed with an understanding of their world?

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19

Communication, language and literacy

Route map

This chapter is divided into four sections. The first section begins with a discussion of the development in the first year of the ability to process speech and produce vocalisations. This is followed by discussion of the role of social interaction in language acquisition and the differences between communication and language. The second section considers explanations of language acquisition that emphasise the role of innate abilities, while the third section considers the opposite perspective, which emphasises the role of experience. Evidence for and against these perspectives is evaluated and discussed. The final section considers the development of literacy; reading is a way of acquiring information that involves language and the development of literacy appears to be associated with a number of linguistic abilities.

Introduction

Children's acquisition of language is a remarkable achievement. At birth infants can give only rudimentary signals of pleasure and discomfort, by 30 months they have a reasonable command of their mother tongue. This is achieved despite initial cognitive immaturity, it is achieved without explicit teaching and it is achieved despite the fact that the structure of human language is extremely complex.

In terms of wider issues of development, language is a medium through which children are educated about their world. It is associated with the transmission of culture and it is a characteristic without which many human achievements would be that much more difficult, if not impossible. Furthermore, language is a human characteristic that makes us different from most, if not all, other species. Given this importance, it is not surprising that language acquisition has been a focus of research interest and debate, a debate that focuses on the nature–nurture argument (see Activity box 19.1).

Hearing, vocalising and speaking

Hearing and vocalising

To process speech we need to be able to identify phonemes. These are the smallest units of sound that can be identified in speech, such as the 'ba' of 'bath' or the 'pa' of 'path'.

Adults' perception of phonemes is categorical: we hear sounds as either 'ba' or 'pa' and do not perceive there to be intermediate sounds. This has the advantage that we hear a 'pa' sound even when it is spoken by different people and in different circumstances. Do infants process sounds in this way?

In the case of adults, we can ask them whether they hear a sound as 'pa' or 'ba'; obviously, we cannot do this with a baby. However, as we saw in the previous chapter, the principle of habituation can be used to find out whether infants perceive one stimulus as similar to or different from another. Eimas et al. (1971) did just this, by measuring sucking on a dummy (pacifier) so that a high rate of sucking produced a phoneme such as 'ba'. Infants learnt to do this, but after a while habituation occurred and the rate of sucking decreased (see Figure 19.2).

When a new sound such as 'pa' was presented, the infants' rate of sucking increased and this change in sucking showed that the infants could distinguish between the two phonemes (dishabituation). If the sucking had not changed, then this would indicate that the infants were unable to tell the difference between the two phonemes.

It was found that 1- and 4-month-old infants showed dishabituation when a new sound was different because it involved a different phoneme; however, there was no change in sucking when the sounds differed by a similar amount, but the two sounds involved the same phoneme. This indicates that infants identify phonemes in a very similar way to adults.

ACTIVITY BOX 19.1

Nature, nurture and language acquisition

Decide which of the views in Figure 19.2 are compatible with 'nature' or 'nurture' viewpoints. What would a compromise position between nature and nurture involve? Which viewpoint do you think is most likely to be correct?

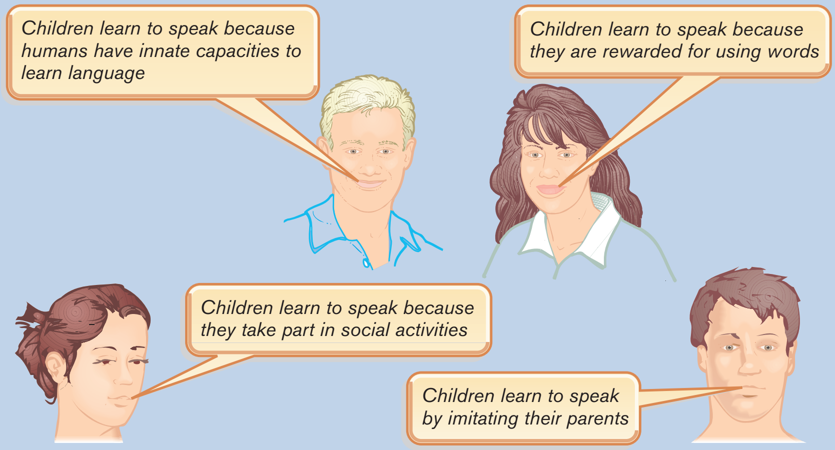
Children learn to speak because humans have innate capacities to learn language
Children learn to speak because they are rewarded for using words
Children learn to speak because they take part in social activities
Children learn to speak by imitating their parents

Figure 19.1 Nature, nurture and language acquisition

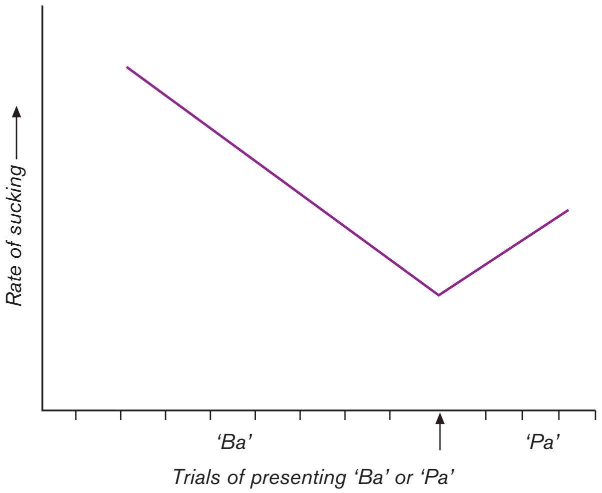

Figure 19.2 Habituation to 'ba'

Further research, however, has revealed that monkeys, chinchillas and even quails also process sounds in a similar way (Kluender et al., 1987; Kuhl and Padden, 1983). Thus the categorical perception of phonemes occurs in a range of biological species and so human speech may be structured in a way that reflects our perceptual abilities rather than human infants being specifically adapted to human speech. Whatever the reasons, the ability of infants to distinguish between phonemes means that their hearing is already tuned in to the important distinctions present in the speech of adults.

Different human languages make use of different sets of phonemes. For example, Japanese people often find it difficult to identify the difference between 'l' and 'r', because their language treats them as being similar. How do infants perform on these tasks?

A process known as 'conditioned head turning' was used to investigate this ability. The infants learnt that if they heard a change in a series of sounds and then turned their head to a display, they would see interesting objects light up. In this way the researchers were able to discover whether infants could detect a difference between certain sounds. Findings indicate that, at least initially, Japanese infants are better than their parents at distinguishing between 'l' and 'r', but by 12 months they perform in a similar way to adults (Werker, 1989). In other words, they lost their early ability to distinguish between sounds that are not important in the language they hear.

There is a similar pattern of development in the production of sounds. Initially, infants produce long vowel-like sounds at around 7 weeks ('oooh', 'aaa'), which are often referred to as 'cooing'. These sounds are adapted to social circumstances, so that higher pitched sounds occur when interacting with their mothers than with their fathers (Boysson-Bardies, 1999).

Babbling starts at around 7 months and consists of a sequence of alternating vowels (e.g. 'a', 'e') and consonants (e.g. 'p', 'd') to produce vocalisations such as 'bodadada'. At first, babbling includes phonemes that are not used in the language heard by a child, but these gradually drop out of the child's repertoire (Boysson-Bardies, 1999).

As infants become older, babbling takes on the characteristics of adult speech and adults can identify whether or not an 8-month-old infant is learning a language, such as French or Arabic (Boysson-Bardies et al., 1984). Interestingly, there are also suggestions that children learning sign languages will use a manual form of babbling, employing hand gestures (Petitto and Marentette, 1991).

These findings show that infants are equipped to deal with the range of human languages. Furthermore, infants adapt their vocalisations to the speech that they hear. Thus, by the end of the first year, infants have made considerable progress in their phonological awareness. These achievements put infants in a position to identify and produce words – an important step along the route to acquiring language.

Self-test: In what ways are infants adapted to use and produce speech? Are these learnt or acquired abilities?

Social interaction, words and attention

Social interaction in the first 5 or 6 months of life often revolves around body games and activities or the reactions of the infant and adult. In many ways, this can be seen as a period when caregivers and infants get to know one another. In western societies, the character of social interaction starts to change at around 5 to 6 months, with more attention and speech being paid to objects and events (Sylvester-Bradly and Trevarthen, 1978).

At the same time, infants become able to follow the gaze of adults to objects located in a room (Scaife and Bruner, 1975). In addition, at around 9 months (as we saw in an earlier chapter), infants start to be able to follow the pointing of adults to easy targets such as objects in front of the pair and by 14 months are able to use geometric principles to follow points at more difficult locations (Murphy and Messer, 1977).

Adults often play what has been termed the 'original word game' with young children, by asking 'Where's the X?' In addition, much of the time adults match their speech so that it is about things that infants are looking at (Collis, 1977). Not only is adult speech matched to the infant's interest, but at about 8 to 9 months infants begin to be able to point at objects themselves (see Messer, 2003). Thus, adult speech is structured around infant interests, with both adults and infants being able to draw the interest of their partner to objects and events.

All these activities involve joint attention and there has been growing appreciation of the importance of this activity for the development of vocabulary. Tomasello and Farrar (1986) were able to show that mothers who named objects more often when 15-month-old infants were looking at them had 18-month-old infants with larger vocabularies. However, this correlation does not establish causation, so that it is of interest that Tomasello and Farrar also used an experimental situation to show that infants learnt the words they heard when looking at an object.

Further research by Tomasello and his colleagues has shown that children around this age are very sophisticated in being able to work out the relation between a word and its referent. For example, an experimenter told 18 month old infants that she was looking for a 'gazzer', picked up one object with disappointment and was pleased when they picked up another object. The children deduced from this that the second object was labelled a 'gazzer' (Tomasello et al., 1996). Focus point 19.1 outlines the way that fewer opportunities for joint attention in twins may slow down the initial acquisition of language.

In general, children make progress in the comprehension (i.e. understanding) of speech before the same achievements

FOCUS POINT 19.1

The importance of joint attention: language development in twins

Studies in the 1930s (Davis, 1937) revealed that the speech of twins was often delayed in comparison to that of 'singletons' (children who are not twins) in terms of when speech starts, a reduced vocabulary and more simple sentences. Davis also observed that these deficiencies decreased during the preschool years. These findings have been broadly confirmed by more recent studies, with catch-up occurring by the school years (Mogford, 1988).

What are the explanations of this early delay in language? One is that the delay might be due to the greater sharing of biological resources during pregnancy or to complications during delivery. Lytton (1980) failed to find strong relations between perinatal complications and language in a group of two- to three-year-old boy twins. Could sharing a rearing environment cause an early delay in language? Two explanations have been put forward. One is that the close relationship between the twins reduces the need for verbal communication. 'Secret' languages have been observed between twins (in the sense that these are unintelligible to others) (Thorpe et al., 2001), and Zazzo (1978) suggests that these secret languages impede the acquisition of the mother tongue.

There is even stronger evidence for the delays being caused by division of resources. Tomasello et al. (1986) examined the speech of twins and singletons between the ages of 15 and 21 months. The singletons were matched to the language level of the twins. The study showed that the mothers talked as much with the twins as with the singletons, but that each child received less speech matched to the focus of their attention, and fewer maternal responses that extended the number of turns in conversation. These characteristics were found to be associated with poorer language development. Thus the difficulties that carers face in dividing resources between twins may lead to the delay in early speech.

Photo 19.1 Joint attention.

in production (i.e. saying a word). Six-month-old infants will often look towards their mother or father when they hear the appropriate word, such as 'mama' or 'dada' (Tincoff and Jusczyk, 1999). Ten-month-old infants can respond appropriately to between 10 and 150 words (Fenson et al., 1994). Somewhat later, between 8 and 12 months, infants start to produce sounds that appear to be recognisable words, although it is surprisingly difficult to be sure when infants use words in a similar way to adults.

The ability to produce words seems to be the result of several processes. Joint attention plays an important part and so does the infant's ability to start to control the complex muscle movements involved in producing sounds. Interestingly, the words employed with young children (such as 'dada', 'papa' and 'mama') match the type of sounds infants find easy to produce. There are also suggestions that early words are tied to particular contexts and objects, so that an infant says 'duck' only about a toy that is used in the bath (Barrett, 1996) and not in connection with other ducks or birds.

What is surprising is that children produce only one word at a time until about 18 months. During this period the use of words undergoes a considerable change, from the uncertainties about the use and meaning of the first words, to what can be quite assertive communication at 18 months. Indeed, there have been suggestions that the first words can have a variety of communicative functions and because a single word often seems to stand for a whole phrase, these utterances are sometimes termed holophrases.

Self-test: Identify social experiences that could make a contribution to the acquisition of speech.

From words to language

At about 18 months children go through a vocabulary spurt when the number of words they produce can increase by several hundred in a few weeks. At around this age children start to produce two-word utterances such as 'want milk'. Interestingly, the order of words in these utterances does not appear to be random: children do not often say 'milk want'. Some believe this is because children are starting to use linguistic rules, while others think this simply reflects the organisation of the speech that children hear (Radford, 1995; Tomasello, 2000).

There are also uncertainties about the cognitive changes that enable this achievement. At around the same age children start to engage in symbolic play (see Chapter 18). Piaget has argued that this general capacity enables children to treat words as symbols, so words can 'stand for' something else.

The next advance is the production of telegraphic speech, with utterances like 'I want milk'. These utterances are much closer to adult language, but elements such as past tense (-ed), plurals (-s), many pronouns (he, she, it) are still absent. Between 24 months to about 30 months many of these linguistic elements become incorporated into children's speech.

The progression that has just been described raises the question of when children start to use language. In everyday speech, we often use the terms communication and language interchangeably. Communication is usually defined as the transmission of information. It is certainly the

FOCUS POINT 19.2

Terms used in the discussion of language

- The arrangement of words in a sentence involves syntactic rules (i.e. 'John loves Jane' is acceptable, but 'John Jane loves' is not).
- The smallest linguistic unit of meaning is a morpheme (so the word 'birds' contains two morphemes 'bird' and '-s'). The arrangement of these elements involves morphological rules.
- What people often think of as grammar is sometimes described as morphosyntax.

Note that psycholinguists are interested in the rules people actually use, rather than laying down rules that should be used. Therefore, British dialects are considered as acceptable as 'BBC English'.

case that other species can communicate: there are the warning cries of animals when they detect danger and most of us have experience of pets who seem to know what certain signals mean (such as picking up a dog lead or saying 'walkies').

However, most psycholinguists regard language as a special form of communication. Two features are considered to make it different from other forms of communication. The first is that meaning depends on the arrangement of the elements ('John loves Jane' as opposed to 'Jane loves John'). The second is the presence of structural dependency. This involves different elements of an utterance influencing one another. Whether we say 'love' or 'loves' depends on the subject of a sentence (e.g. 'John loves Jane' rather than 'They love Jane'). Most forms of animal communication do not have these characteristics. Some technical terms used to discuss language are given in Focus point 19.2.

Self-test: Describe the main features of children's progress from nonverbal communication to language.

Innate characteristics and language acquisition

Although reinforcement (see also Chapter 8) can account for many aspects of learning, Skinner's attempt to explain language acquisition in this way failed to find acceptance. Skinner suggested that children initially produce sounds at random and that the reinforcement of appropriate sounds results in the production of recognisable words. Following this, the reinforcement of certain arrangements of words provided the basis for language development.

Self-test: How does language differ from other forms of communication?

A review by Noam Chomsky (1959) of Skinner's (1958) book *Verbal Behavior* made a number of very important criticisms. One was that a finite number of words can be combined using linguistic rules to generate an infinite number of different utterances. Chomsky argued that language cannot be learnt by forming specific associations – instead, children need to acquire general linguistic rules in order to generate the infinite number of utterances that are possible. Chomsky's review was a starting point for a renewed interest in the possibility that language acquisition is the result of innate predispositions.

The language acquisition device (LAD)

In the 1960s Chomsky and his associates proposed that children have an innate language acquisition device (LAD) (see Figure 19.3). The LAD enables children to abstract linguistic rules from the speech they hear. Not much detail was provided about this process, except it was supposed that children have access to what is termed universal grammar (this is the rules that lie behind different human languages) and it was supposed that they can simply match the language they hear to one of these sets of rules.

According to this model, children hear speech and match what they hear with one of the human languages present in universal grammar. This enables them to produce language without having to learn its grammar.

Several forms of evidence supported the idea of an LAD. One was that children make overgeneralisation errors (e.g. 'goed', 'wented') that cannot be learnt by imitation as adults do not say such words and so the words appear to be the result of the inappropriate use of a linguistic rule. Young children also have the ability to generalise linguistic rules to new words. Berko (1958) presented 4-year-olds with a picture of an imaginary animal and called it a 'wug'. When she presented two of these animals and asked what they were, the children replied 'wugs'. This demonstrated the ability to create new linguistic forms without modelling or reinforcement.

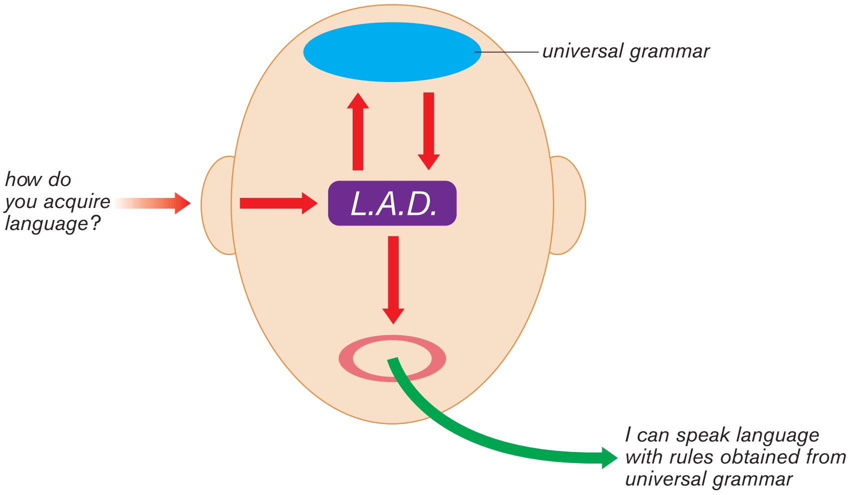

Figure 19.3 The language acquisition device (LAD)

Principles and parameters theory (PPT)

The LAD explained language acquisition, but did not provide much in the way of detail about the process. For these and other reasons a new model of language acquisition was developed by Chomsky and his colleagues. The new model has been termed principles and parameters theory (PPT) or sometimes government and binding theory (GB theory) (Chomsky, 1986). The 'principles' referred to in the name of the theory are the elements that are present in all human languages. The parameters refer to characteristics that are different across different languages. For example, it is believed that all languages contain nouns – a principle. But English and Japanese have different subject–verb order – a parameter.

In PPT, it is supposed that children identify parameters from the speech they hear. At first, this was seen as similar to setting a switch to one of several positions, much as you might switch a light on or off. Thus children acquiring English would have a parameter set for one type of subject–verb order, whereas children acquiring Japanese would have a different parameter set. In this respect, PPT shares similarities with the LAD – children are assumed to have innate access to the basic rules governing all human languages. As there are many linguistic rules in a language it is supposed that parameter setting can simultaneously involve a number of these rules.

Related to these ideas was the proposal made by some researchers that human cognition involves a number of modules. A module consists of a set of operations that are largely independent of other cognitive processes and are considered to be fast, automatic and usually without conscious awareness about how decisions are made (Fodor, 1983). Language is a prime candidate for modular operations. Furthermore, the idea of a language module is compatible with the system being inherited rather than learnt.

Williams syndrome is a rare condition that appears to be caused by the deletion of genetic material. It involves cardiovascular problems, what has sometimes been termed an 'elfin' facial appearance and an uneven profile of abilities. Children who have this condition have been described as having advanced language capacities relative to other areas of functioning and this has been interpreted as providing support for the modular view of language (Pinker, 1994).

However, more recent research has questioned this interpretation by the use of careful investigation of a range of abilities possessed by these children (Karmiloff-Smith and Thomas, 2003; Karmiloff-Smith et al., 1997; but see also Clahsen and Almazan, 1998). In particular, individuals with Williams syndrome have low scores on assessments involving the comprehension of grammar and French children with Williams syndrome have difficulties with the gender of their language (e.g. being able to use masculine and feminine nouns appropriately). Thus, a number of researchers have obtained findings that suggest the language of children with Williams syndrome is not in advance of their other abilities.

Research into PPT has usually involved finding out the age at which children are able to produce particular grammatical forms and then assuming that this involves parameter setting. It is important to recognise that such findings do not actually test PPT; rather, evidence is produced that is consistent with it.

Findings that suggest young infants are searching for patterns in the speech they hear provides support for PPT. Aslin et al. (1998) played four nonsense 'words' (i.e. utpiro, golabu, bidaku, padoti) to 8-month-old infants. The 'words' were presented in a random order, with no pauses between them, for 2 minutes. Then infants either heard the same nonsense words or they heard the words combined in different ways. It was found that the infants listened longer to the new combinations, showing that they had learnt the way these words had been combined and were interested in the new combinations.

Other evidence supports the claim that humans have innate linguistic abilities. A study by Goldin-Meadow and Mylander (1990) investigated whether sign language would develop spontaneously. The sample consisted of 10 deaf children of hearing parents who were in programmes that discouraged the teaching of sign language. The gestures of these children appeared to involve a primitive form of grammar that involved the ordering and the positioning of gestures (the position of the hands is an important component in many sign languages).

There are also findings about the creation of a sign language that accompanied a change in schooling in Nicaragua. Deaf children were brought together in a special school, but at the time adults did not know any sign languages that could be taught to them. However, a primitive sign language emerged out of the gestures children used to communicate with one another. In addition, when younger children joined the school they started to make this system more elaborate so that it became a fully developed sign language (Senghas and Coppola, 2001).

A similar pattern is claimed to occur in the use of pidgin and Creole languages. Pidgin speech develop when people using different languages need to communicate with one another and a common set of words starts to be used that borrows from these different languages. However, pidgin language lacks many features of a full language, such as the use of grammatical endings to words. Sometimes there is the development from pidgin speech into what is termed a Creole language, for example, when people from several different language groups came to Hawaii to work on sugar plantations. Bickerton (1990) has claimed that children were largely responsible for introducing more sophisticated linguistic elements to create this Creole language (see Focus point 19.3).

Examples of sign and Creole languages support the idea that language is an inherited human characteristic.

FOCUS POINT 19.3

Creole language

The Creole language Tok Pisin has become a national language in Papua New Guinea. The following lines are taken from a famous comic strip published there.

- 'Sapos yu kaikai planti pinat, bai yu kamap strong olsem fantom.'
- 'Fantom, yu pren tru bilong mi. Inap yu ken helpim mi nau?'

The translation of these is as follows.

- 'If you eat plenty of peanuts, you will come up strong like the phantom.'
- 'Phantom, you are a true friend of mine. Are you able to help me now?'

However, the findings are not totally consistent with the idea of PPT, because languages seem to develop spontaneously without any clear model for the parameter-setting process. It is possible, however, to argue that a 'default' parameter is used in the absence of any input.

A debate about the innate basis of language between Chomsky and Piaget (Piattelli-Palmarini, 1980) resulted in the former predicting that blind children would acquire language with little difficulty because all that is necessary for this process is exposure to language. Children who are blind (and have no other disabilities) acquire language at about the same rate as sighted children. This supports Chomsky's prediction.

However, it can be argued in the case of children who are blind that language acquisition does not occur by exposure to a disembodied stream of speech, but by caregivers matching their speech to what a child shows an interest in touching. This view is supported by findings that appear to show that merely hearing speech is insufficient for language acquisition. Children whose main source of speech input is from television, either because their parents are deaf or because they watch cartoons that are in a different language, make little or no progress with the language they hear (Sachs and Johnson, 1976; Snow, 1977). And as we have seen, there are delays in the language of twins, which can be attributed to only half the speech they hear being linked to their own activities and interests.

A number of concerns have been expressed about the plausibility of PPT. For example, what types of parameter are set when sign languages are acquired and how can the same parameter be set in different positions when bilingual children acquire two or more languages? In addition, concerns have been expressed about the neurophysiological plausibility of PPT. Many complex biological systems are not 'hardwired' in the way that PPT suggests and this lack of hardwiring has the advantage of allowing adaptability to environmental variation.

Self-test: It has been argued that language development is largely the result of innate processes. What findings support this argument?

The dual-route model

In English, we add '-s' to nouns to make them plural (e.g. egg → eggs), or '-ed' to create the past tense of verbs (e.g. walk → walked). These are words that follow the regular rules of English. However, there are also irregular items that do not follow these rules (e.g. the word sheep can be both singular and plural and the past tense of 'go' is 'went').

The dual-route model has been used to explain the acquisition of regular and irregular words within the PPT tradition (see Figure 19.4). This theory supposes that regular words are produced by a computational process, such as adding '-ed' to make the past tense of verbs. Obviously, this route will produce errors like 'goed' if it is applied to irregular words.

According to this model, children produce speech in different ways according to whether the word is regular or irregular. For a regular word like 'acquire' children form the past tense simply by adding '-ed' to give 'acquired'. For irregular verbs like 'learn' the children have to search their memory to locate the appropriate word, i.e. 'learnt'.

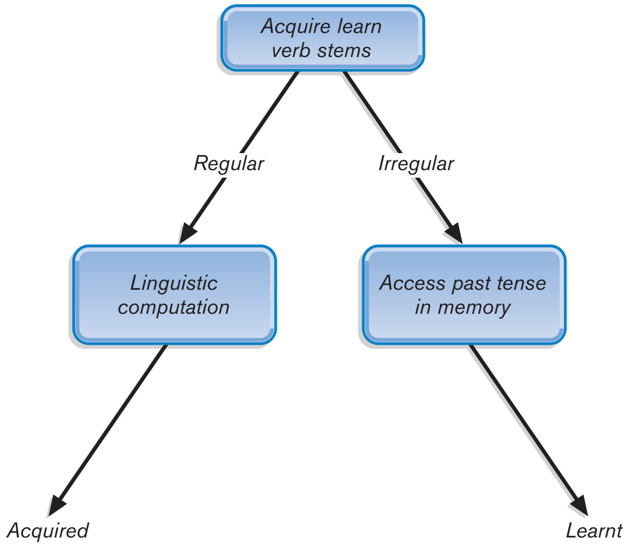

Figure 19.4 The dual-route model

In the dual-route model, the irregular words are learnt individually, and when they are learnt they block the regular computational process from occurring. The predictions of the model have been tested by giving people the present tense of a verb and measuring how quickly they produce the past tense. The speed of producing the past tense of regular verbs does not depend on how common the verb is in a language, suggesting that the same computational process occurs for rare and common regular verbs. However, the speed of producing irregular verbs depends on how common they are: rare irregulars are produced more slowly than common irregulars, suggesting that familiarity with these verbs influences how quickly they are retrieved.

Self-test: What aspects of the dual-route model involve innate processes and what aspects of the model involve learning?

Section summary

PPT has been very influential. Supporters of the theory believe that it provides a framework for understanding language acquisition and argue that it offers a coherent theory about the acquisition of grammatical rules that is lacking in other approaches. Furthermore, it makes sense that humans have biological and cognitive predispositions that enable them to acquire language so easily. What is still debated is the extent to which the environment plays a role in the acquisition process.

The role of the environment

Imitation and simplification

Imitation of adult speech seems an obvious way in which children could acquire language – after all, French children acquire French and Japanese children acquire Japanese. However, examples like the one in Focus point 19.4 show that providing model utterances does not always help children. This strengthens the case for an innate LAD.

Investigators in the early 1970s also realised that speech to children is not the same as it is to adults (see Activity box 19.2). The investigators recorded mothers talking to their children and to another adult. It is worth pointing out that writing down (transcribing) speech is a laborious process: it can take an hour to transcribe 5 minutes of conversation. As many of you will no doubt realise, speech to children was found to be different from speech to adults. This sort of speech has been called *motherese*, *baby talk* and, more recently, child-directed speech (CDS). Some of the differences that have been found are shown in Figure 19.5.

CDS is found in many language groups, ranging from Apache to Arabic (Ferguson, 1964) and even 4-year-olds use simplified CDS with infants (Shatz and Gelman, 1973). Furthermore, infants prefer to listen to CDS than to other speech (Cooper and Aslin, 1990).

It also appears that adults modify sign language in ways that could aid acquisition. For example, adults tend to sign near to relevant objects rather than in the usual position for certain gestures (e.g. near their face or upper body). Signing in the usual position would make it difficult for children simultaneously to see both the appropriate gesture and the relevant object (Harris et al., 1989).

An important question is whether these simplifications assist language development, and there is still no consensus about the answer to this question. Part of the reason is that, for ethical reasons, correlational rather than experimental studies have to be conducted (see Research methods box 19.1). In addition, many of these studies have failed to find relations between the extent of speech simplification at one age and children's language development at a later age (Furrow and Nelson, 1986; Scarborough and Wyckoff, 1986). Thus, the evidence that CDS helps language acquisition is not particularly convincing.

There have also been claims that in some cultures children do not receive CDS in the simplified form that is common in the middle-class families of the west. As children in these cultures develop language, then CDS cannot be considered necessary for language acquisition (Heath, 1983; Ochs and Schieffelin, 1984). However, Snow (1995) has pointed out that while some features of CDS are absent in some cultures, no culture has been identified where all features of CDS are absent.

FOCUS POINT 19.4

The failure of modelling and imitation

The following is a widely quoted example of a conversation between a child and his mother that appears to show the difficulty of teaching children by getting them to imitate correct utterances.

> *Child:* Nobody don't like me.
> *Mother:* No, say 'Nobody likes me'.

This sequence is repeated eight times.

> *Mother:* Now listen carefully, say 'NOBODY LIKES ME'.
> *Child:* Oh! Nobody don't likeS me.

ACTIVITY BOX 19.2

How do you speak to children?

In the late 1960s some people were so taken with the idea that powerful innate processes made language acquisition possible that statements like the following were made.

> . . . the language learning environment of the child does not differ in any useful way from that of an adult . . . it must contain a very substantial number of false starts, slips, grammatical mistakes and so forth.
> (Fodor, 1966: 109)

This claim strengthened the argument that something like an innate LAD is present in humans. However, try to rehearse in your mind how you would speak to a young baby or child, and spend a few seconds writing down the differences between your talk to a young child and an adult. What did you find?

Self-test: Do you think CDS helps language acquisition? Why is it difficult to answer this question?

Feedback and contrast

Another topic about which there has been controversy concerns whether children are provided with feedback about grammatical errors. This issue is important because if children do not receive feedback then it is difficult to explain how they 'learn' language and so claims about innate processes are strengthened. A classic study by Brown and Hanlon (1970) examined adults' reactions to children's ungrammatical speech. They found overt correction of errors was extremely rare: if a child said 'he goed', adults were likely to accept this and not reply 'that's incorrect, you should say he went'.

Additional studies in the 1980s confirmed Brown and Hanlon's findings, but also revealed that when children make a grammatical mistake adults are likely to produce an expansion that usually involves the adult supplying a grammatically correct version of the child's utterance or they ask a follow-up question (as shown in Focus point 19.5) (Bohannon and Stanowiczz, 1988; Bohannon et al., 1990; Demetras et al., 1986; Hirsh-Pasek et al., 1984; Penner, 1987). When a child's utterance is grammatically correct, adults tend to continue the topic of conversation.

Self-test: What is the difference between reinforcement and feedback?

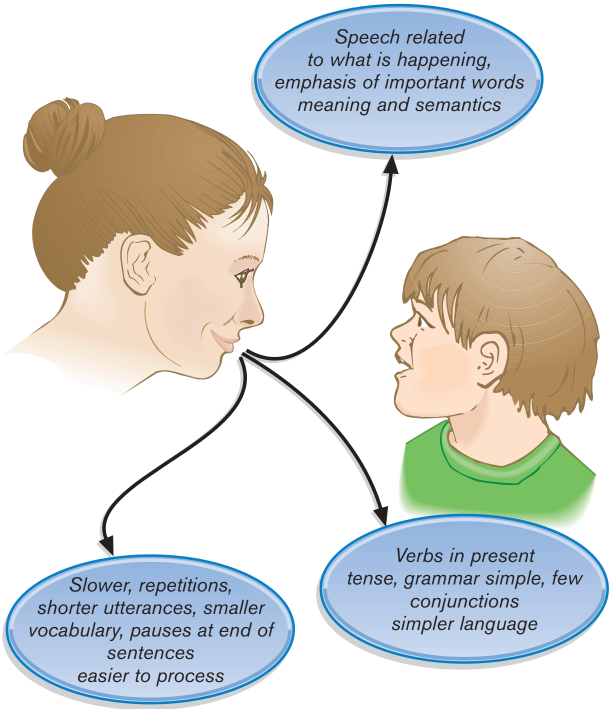
Speech related to what is happening, emphasis of important words meaning and semantics
Slower, repetitions, shorter utterances, smaller vocabulary, pauses at end of sentences easier to process
Verbs in present tense, grammar simple, few conjunctions simpler language

Figure 19.5 The characteristics of child directed speech (CDS)

RESEARCH METHODS BOX 19.1

Correlations and causation

Investigations into the effects of CDS have usually involved seeing whether the mother's simplified speech at time 1 is correlated with children's language at time 2 (see Figure 19.6). This would mean that mothers who simplify their speech more at time 1 have children who have more advanced language at time 2. Even if a significant correlation is found, why does this fail to establish that mothers who simplify their speech are responsible for (i.e. cause) the growth in the language of their children? If you are not sure about this, look at Fig. 19.6.

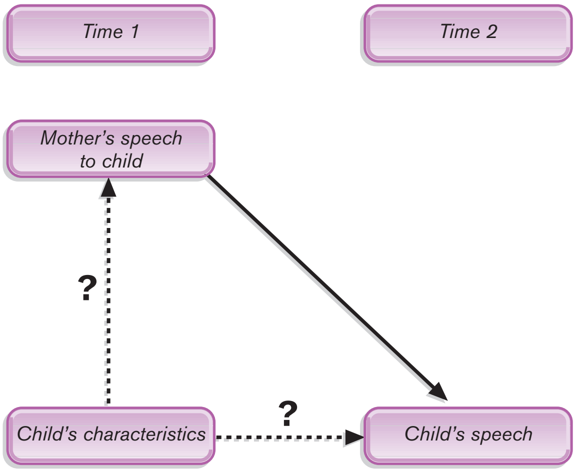
Time 1
Time 2
Mother's speech to child
?
Child's characteristics
?
Child's speech

Figure 19.6 Influences that are possible on mother's speech at time 1 and children's language at time 2

FOCUS POINT 19.5

Contrast between child and adult speech: example of an adult providing a correct grammatical structure

> *Child: That policeman FALLED all the way down to the tiger.*
> *Adult: He FELL down.*

An interesting perspective about these reactions has been provided by Saxton (1997). He argues that expansions supply a useful contrast between the child's incorrect speech and the 'correct' adult utterance. This provides a mini-learning session for the child. Supporting evidence comes from observations that children are more likely to repeat an adult expansion than other adult utterances (indicating that they are processing the information in expansions (Farrar, 1992)) and from experimental investigations of the effect of providing expansions (Saxton, 1997).

These suggestions are extremely interesting but there are still uncertainties about their significance for the general process of language acquisition.

Constructivist views

Tomasello and his colleagues have rejected many aspects of PPT and emphasised the role of speech to children. Tomasello (2000) starts with the assumption that children and adults need to be conventional in the sense of using language in a similar way to other people and creative in the sense of being able to use language in new ways to create new meanings. (A similar point to that made by Chomsky!)

However, Tomasello has argued against children having access to a universal grammar. He believes that if children have a universal grammar, they should be able to take a new word and start to use it in the same way as other nouns or verbs (or any appropriate linguistic class) that they have in their vocabulary. Instead, he suggests that children construct their grammar *gradually*, first by producing utterances similar to those they have heard, and then by noticing that different groups of words, such as nouns and verbs, occupy very different positions in utterances (e.g. in English, nouns tend to be at the beginning or end of an utterance).

Various pieces of evidence have been produced to support this claim. For example, a study by Tomasello et al. (1997) investigated children's ability to treat a new word as a verb or noun. These were 'nonce' (i.e. made-up) words, such as 'tam' and 'gop', to ensure the children had not heard them before.

Children aged between 18 and 23 months heard two novel words used as verbs (e.g. 'it's tamming') and two novel words used as nouns (e.g. 'that's a gop') over many sessions. It was found that the children could use the new nouns in a similar way to the other nouns they had in their vocabulary (e.g. they said 'some gops'). But new verbs were used only in utterances similar to the ones in which the children had heard the new verb; they did not use the new verbs in a similar way to the other verbs in their vocabulary (e.g. saying 'it tammed' to produce the past tense of a verb).

Additional evidence comes from observations by Tomasello (1992) of his own daughter. He found that each verb tended to be used in an individual way, so that his daughter was not operating with a general set of linguistic rules to create utterances with verbs; rather, she was using each verb in a restricted manner. This he termed the verb-island hypothesis.

In addition, work by Lieven and Pine and their colleagues has revealed that many of children's first utterances are extremely similar to the speech they have already heard (Pine and Lieven, 1997; Theakston et al., 2001). These findings and claims provide a direct challenge to the idea that children have access to innate specifications about linguistic rules and classes.

Self-test: What findings suggest that children do not use general grammatical rules in their early language?

Connectionist networks

PPT suggests that there are specific cognitive systems devoted to language acquisition. A contrasting perspective involves connectionist networks, neural networks and parallel distributed processes (these terms are often used interchangeably) and involves the idea that language acquisition is just one of many aspects of cognition that involve general learning processes (Plunkett et al., 1997). This approach uses computer programs that are designed to imitate the changes that occur during development.

To study language acquisition, computers are usually given speech relevant to a specific aspect of grammar (e.g. they might be given verbs in the present tense such as 'like' and have to learn to produce the past tense such as 'liked'). Usually, the computers are given this speech after it has been converted by some means into numeric form. At first the computer makes random connections between the 'input' (e.g. the present tense of a verb) and a range of outputs (e.g. various possible past tense forms). After this 'guess', the computer is usually given information about whether or not its response is correct. If the response is correct, the tendency to produce the connection in future is strengthened. If the response is incorrect, the tendency is weakened (these adjustments are known as backpropogation).

RESEARCH METHODS BOX 19.2

Modelling the past tense

The difficulty of learning the regular and irregular past tense of verbs presents a considerable challenge to connectionist systems. However, these systems can be successful, and when they make errors these tend to be similar to the errors made by children. The first attempt to do this was made by Rumelhart and McClelland (1986); however, their model was criticised for using speech input that would help produce the findings the experimenters wanted.

Later connectionist systems took account of the criticisms and were still able to show learning of both regular and irregular words (Plunkett and Marchman, 1993). Part of the reason for this success seems to be that although irregular verbs do not follow general rules and would be expected to be more difficult to learn, they are much more common in CDS (think how often we say 'went' rather than 'started'). As a result, connectionist networks (and possibly children) are able to learn irregular verbs because they are so common in CDS, and this learning occurs while the computer also abstracts a general principle of adding '-ed' to regular verbs (see Smith et al., 2003).

Using these techniques, computers can learn aspects of language such as the past tense of verbs (see Research methods box 19.2). It should be noted that few people claim that connectionist systems imitate exactly the process of language acquisition or are the same as the network of neural connections in the brain.

The research described in Research methods box 19.2, along with other research, has challenged PPT in several ways (see Plunkett, 1995). First, the learning mechanisms are not specialised for language – they are general learning processes that can be used to model a range of cognitive developments. Second, the computer does not contain any linguistic rules (all the learning is in terms of mathematical adjustments that govern the choice of output), yet the computer behaves as if it was governed by rules. Third, there is no specific innate knowledge of the rules of grammar supplied to the computer. Thus, it would seem that non-specialised but sophisticated learning systems can acquire rules in a very different way to PPT.

However, there are two important limitations of connectionist systems. The first is that most systems are given feedback about the correctness of every response they make and this does not occur with children. The other issue is that most connectionist modelling involves only one aspect of language (e.g. the past tense) and the speech given to the computer is usually selected by the researcher to contain only these forms. Children, by way of contrast, seem to learn a number of linguistic forms at the same time (e.g. tense, plurals, word order and so on). It remains to be established whether connectionist systems can be devised to deal with a much higher level of complexity in the input and output.

Self-test: How does a connectionist network learn to produce language?

Section summary

Several aspects of children's environment could help language acquisition but there is an absence of compelling evidence that this help is effective. However, the detailed research in the constructivist tradition and in connectionist modelling provides indications that although language may be innate it is not necessarily acquired through a process of parameter setting.

Self-test: Look back at Activity box 19.1. How would you answer these questions now?

Literacy

Unlike with language acquisition, most children have to be taught to read, write and spell. Furthermore, until comparatively recently, few people possessed these abilities. The precise origins of writing are uncertain, but a number of cultures developed symbolic systems they could use to make records of agricultural produce, taxes and events. Because of the importance of literacy to individuals and to society, it has been the topic of extensive research (see Activity box 19.3).

ACTIVITY BOX 19.3

Differences between language and literacy

Literacy involves reading, spelling and writing. Language and literacy differ in a number of important ways.

Write down some of the ways in which you think they differ.

Models of reading: the dual-route model

When we read, we usually convert the letters we see into a word that we have in our lexicon. Traditionally, the lexicon is thought to contain details about the phonological characteristics (i.e. sounds), meaning and linguistic properties of each word. The conversion of letters to sounds and putting these sounds together to identify words in our lexicon is one of the routes proposed by Coltheart in his dual-route model. However, we can also read the following: 'One day the mib fell in the feg', which contains words that are not in our lexicon. Observations such as this provided a basis for a second route that involves grapheme–phoneme (letters to sounds) conversion, but does not involve the lexicon.

FOCUS POINT 19.6

Frith’s stages of reading development

At the logographic stage children learn to read a few words on the basis of visual recognition – for example, their own name.

The alphabetic stage involves decoding words into single letters and converting these into sounds (phonemes).

At the orthographic stage words are broken down into smaller (orthographic) groups of letters. Goswami and Bryant (1990) suggest that children break written words into ‘onset’ and ‘rime’ (i.e. the rhyming part of a word). For example, the beginning sound ‘c’ of ‘cat’ is the onset, while the rime is the sound of the rest of word, the ‘at’ of ‘cat’.

More recently, it has been found that some patients with brain damage are not able to say what words mean but can read these words aloud and this has provided the basis for the description of a third route.

Although the dual-route model provides a good overview of the process of reading, it is descriptive rather than quantitative and does not address the issue of learning to read. In addition, it has been found that the lexical and non-lexical routes are not totally independent (Kay and Marcel, 1981).

Several models of reading development have been proposed. One of these was put forward by Frith (1985) (see Focus point 19.6).

Frith’s stage theory and others like it have provided a very useful description of children’s strategies when reading. However, the order of the stages does not appear to be universal and can depend on the type of teaching and the nature of the language being read. In addition, Ehri (1992) has suggested that skilled readers will start to recognise words as a whole and this might be thought of as a further developmental stage, which in some respects is like the original logographic stage but involves knowing a very much larger set of written words.

Another problem with the stage theories is that they do not capture the way that reading involves building on and developing phonological skills. As adults, it is easy to forget that reading involves not only identifying letters but also being able to identify the sounds of our language so that we can relate printed letters to these sounds (i.e. phonemes).

Most of us do not remember that before we began to read we had only a very limited ability to process phonemes in words. Preschool children can tell the difference between the words ‘bat’ and ‘mat’ but they have great difficulty splitting words up into separate phonemes (Liberman et al., 1974). They also have difficulty in saying which words begin with the same sound (alliteration) or end with the same sound (rhyme). Both of these tasks are often used to assess phonological awareness.

An important study of reading development was carried out by Bradley and Bryant (1983). They found that preschool children who were better at phonological awareness tasks involving rhyme and alliteration were, 3 years later, better at reading. Furthermore, the children who were better at phonological awareness in preschool were no better than other children at general mathematical tasks.

Self-test: What is phonological awareness?

Bradley and Bryant’s work also showed that young children who were given help to develop phonological skills tended, when they were older, to be better readers than children who were not given this training. Thus both correlational evidence and evidence from interventions suggest that phonological awareness plays an important part in helping children learn to read. These studies established the importance of prereading phonological skills and the findings have been replicated by a number of investigators and in different languages.

Languages differ according to how close a correspondence there is between letters and sounds. Languages such as English are often termed opaque languages as it is often difficult to work out the sound of a word from the way it is spelt (think about the different ways of saying ‘c’ in ‘cat’ and ‘chat’). In contrast, other languages, such as Turkish and German, are termed transparent languages because the spelling of words closely corresponds to their sound.

Although it is difficult to make comparisons between languages that are not confounded by other variables (such as the way reading is taught), a number of findings indicate that it is easier to learn to read in transparent systems. For example, Wimmer and Goswami (1994) compared English and German children. There were similarities in the speed and accuracy of reading numerals (1, 2, 3 etc.) and number words (one, two, three etc.), but English children were slower and more inaccurate in reading non-words.

Up to now our discussion has focused on the influences of various cognitive processes on literacy. However, there is also evidence that the development of reading has its own effect on a range of cognitive skills – in particular, being able to read seems to assist the development of vocabulary and phonological skills. Evidence to support this claim comes from a study by Morais et al. (1987), which compared Portuguese people who had been taught to read in adulthood with a group who were still illiterate. The adults who could read were much better at phonological awareness tasks.

Another interesting example comes from studies of Chinese children. Chinese writing involves the use of what are termed *pictograms*. These symbols correspond to elements of meaning rather than sounds. This makes the acquisition of reading a difficult process. As a result, when reading is being taught, Roman letters (i.e. the letters we use in writing) are sometimes given to accompany pictograms. The use of Roman letters is phased out over time. Read et al. (1986) found that Chinese adults who had been exposed to Roman letters were able to add or delete phonemes from words and then were able to say the resulting sound (i.e. in English the task would be to remove the first sound of the word 'cat' and say what the remainder of the word sounds like: 'at'). However, individuals who had not been taught with the help of Roman letters had great difficulty with this task. This suggests that learning about the relation between letters and sounds helps children to break down words into phonemes.

Another area of research has revealed connections between memory, vocabulary and reading. Short-term memory (STM), as assessed by auditory digit span (repeating a series of digits) and non-word repetition (repeating nonsense words) and vocabulary size are reasonably closely related in young children. This means that a child who has a large STM tends also to have a large vocabulary (e.g. Michas and Henry, 1994).

Baddeley et al. (1998) have argued that this relation occurs because phonological short-term memory helps children to remember words and this supports language development (although they also acknowledge that larger vocabulary sizes might help with the memorisation of words). In addition, Baddeley et al. suggest that children with higher phonological STM capacities and larger vocabularies develop literacy abilities faster than other children.

Connectionist modelling provides yet another perspective on reading. A print-to-speech connectionist system was designed by Seidenberg and McClelland (1989) to learn the relation between letters and sounds (see page 277). The connectionist system was reasonably successful and the types of error were similar to those found in children. More recently, Plaut et al. (1996) have developed a model that more closely corresponds to what is known about the development of reading. In this model, graphemes and phonemes were available to the connectionist system. As would be expected, this improved the system's performance. The use of connectionist modelling has been useful in drawing attention to the learning processes underlying reading. However, as with many connectionist models of development, the learning environment is assumed to contain consistent feedback about the production of correct and incorrect phonemes – something that children rarely receive.

Self-test: List the cognitive abilities and processes that have relevance to literacy.

Dyslexia and literacy difficulties

It has been known for over a century that there are children who appear to have a special difficulty with literacy that would not be expected on the basis of their other abilities (such as nonverbal reasoning) (see Applications box 19.1). This is usually considered to involve developmental dyslexia, which is distinct from acquired dyslexia. The former is present from the early stages of reading; the latter is not present in childhood but is usually the result of a brain injury in later life. In this chapter, the term will be used to refer to developmental dyslexia (see Applications box 19.2 for information about 'poor comprehenders', another form of reading difficulty).

As we have seen, phonological abilities appear to play an important part in the development of literacy abilities. Stanovich (1986; Stanovich and Siegel, 1994) proposed in the 'phonological core hypothesis' that difficulties with phonological processes are the main cause of dyslexia. It is believed that these difficulties cause children with dyslexia to have imprecise or, as they are sometimes termed, 'fuzzy' representations of phonemes. As a result, when they are learning to read it is more difficult for them to detect consistent patterns between letters and sounds (Swan and Goswami, 1997).

There are many studies that have findings consistent with the phonological core hypothesis. Bradley and Bryant (1978) found that children with dyslexia were worse at phonological awareness tasks than children with a similar reading age, but who were much younger.

Other evidence comes from a study conducted by Scarborough (1990), who followed up 32 children from 2 to 7 years who had at least one parent with dyslexia. 65% of the children were later identified as having dyslexia; these children were found to have the same vocabulary size at 2½ years, but more speech mispronunciations and simpler sentences, than other children in the sample. At 5 years they performed less well on assessments of phonological awareness.

However, there are also findings which suggest that the nature of literacy difficulties may differ from language to language. German children have a comparatively easy task in learning to relate letters to sounds because this relation is very consistent (unlike in English). Wimmer et al. (1998) found that German children with literacy difficulties tended to be slower at reading than their peers but they did not have appreciable difficulties in decoding (i.e. converting letters into sounds). Thus it may be that phonological skills are not as important in languages where there are regularities between letters and sounds.

Related to this are suggestions that dyslexia could be the result of two types of problem, one involving phonological awareness and the other involving speed of processing. This is an idea put forward by Wolf and Bowers (1999) in their double deficit model of dyslexia and there is evidence that

APPLICATIONS BOX 19.1

Children with language difficulties

In recent years there has been a considerable amount of research into children who have specific language impairment (SLI). These children have difficulties with language that would not be expected on the basis of their other abilities (e.g. non-verbal reasoning). It has been estimated that somewhere between 5 and 10 per cent of children have SLI.

The causes of SLI are still not very well understood. There is a range of profiles and there is a strong possibility that the condition might be caused by different factors (Conti-Ramsden et al., 1997). Research using twin studies has revealed that SLI is highly inherited, but this in itself does not tell us what cognitive difficulties give rise to the condition (Bishop, North and Donlan, 1995).

One explanation of SLI uses ideas derived from PPT and findings from a family who had language difficulties over three generations. These individuals had problems producing regular endings to words (e.g. walk + ed).

An explanation put forward by Gopnik and Crago (1991) was that these individuals were not able to follow the computational route of the dual-route model (see page 274). As a result, any language learning would be on a word-by-word basis rather than using a rule to generate the past tense or some other aspect of language. This explanation has been extended to children with SLI.

The explanation has difficulties in accounting for some forms of language disability such as those to do with word-finding difficulties that involve problems in retrieving words that the child knows (Dockrell et al., 1998; 2002).

A different explanation for SLI has been put forward by Leonard (1998). He suggested that children with SLI have difficulties with those grammatical features of languages that are difficult to hear and identify (e.g. the '-ed' of the past tense is said without emphasis). Thus one would expect that children with SLI would have different types of difficulties with different languages. Comparisons between English and Italian children with SLI tend to support this hypothesis (Leonard et al., 1998).

APPLICATIONS BOX 19.2

'Poor comprehenders'

Some children have difficulties understanding speech and writing and have been termed 'poor comprehenders' and it is estimated that somewhere between 5% and 10% of children in mainstream classes have these difficulties. 'Poor comprehenders' like children with dyslexia, have scores on nonverbal reasoning tests that are similar to typical children. Unlike children with dyslexia they are able to translate printed words into speech a process known as decoding. However, their scores on tests of reading comprehension are low (Nation, 2005).

Investigations of the cognitive abilities of children with dyslexia and 'poor comprehenders' have revealed that children with dyslexia have worse phonological abilities than 'poor comprehenders', so that they make more phonological errors when naming pictures. In contrast, poor comprehenders are less able to make use of semantic priming that involves providing the meaning of related words to help them with a task (e.g. reading or naming a picture). Thus, it appears that literacy difficulties can be caused by difficulties in processing either phonological or semantic information and the type of cognitive difficulty affects the type of reading problem that is present.

both phonological abilities and speed of reaction time are independently related to reading abilities (Catts et al., 2002).

Explanations of dyslexia have also concerned the visual system. Many clinical reports exist of children with reading difficulties who have problems with: letters moving on a page; letters changing place in words; or letters like 'c' and 'l' being fused and read as 'd'. In addition, Talcott et al. (2000) have shown that the visual abilities of children with dyslexia are different from those of other children. Children with dyslexia had higher thresholds for perceiving coherent motion across a large display of random dots (kinematograms). In addition, correlations were found between performance on these tasks and literacy skills. These findings suggest that dyslexia may involve other difficulties beyond phonology, at least in some groups of children.

Self-test: What explanations have been proposed about the causes of dyslexia?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Discuss the way in which early speech perception and vocal development are the result of both inherited and acquired dispositions.
2. Describe the way in which social interaction helps children acquire their vocabulary.
3. Distinguish between communication and language.
4. Discuss the role of universal grammar in relation to PPT.
5. Describe the evidence for and against PPT.
6. Explain why correlational studies do not establish causation.
7. Describe the reason why constructivists do not think children have access to universal grammar.
8. Explain how a connectionist system arrives at the past tense of verbs.
9. Describe the phonological hypothesis about reading.
10. Discuss the causes of dyslexia.

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20

The self, others and social relationships

Route map

The way in which children think about themselves and the relationships they have with others are important and interconnected aspects of development. The chapter starts off by describing representations that infants may have of their self and the further development of this concept is then discussed. This is followed by a consideration of attachment, the history of this research, the way in which attachment develops and the consequences of separation. Attachment forms a bridge between the self and others; another bridge involves children being able to understand what goes on in the minds of others. This is the topic of the third section. The final section considers another aspect of the self and others – the way that relationships with parents and peers change in adolescence and the factors that may be responsible for this.

Introduction

A newborn baby comes in to a world that can be categorised in lots of different ways and with many different possibilities to capture their attention. There are all sorts of objects that differ in terms of colour, shape and size. There are all kinds of things that differ both in their physical characteristics and in the way they move; some movements are relatively regular, like those of a tree waving in the wind, others are more irregular, such as the movements of people. How do infants place themselves in relation to all these things that are around them? When do they recognise that they can cause events to happen? When do they become aware of their own characteristics and identity?

These questions are related to a number of different topics about the development of the self and the development of identity. A distinction is often made between 'the I' and 'the me' (James, 1890; Lewis and Brooks-Gunn, 1979).

The 'I' refers to the recognition of the self as an agent, an awareness that one can cause events to occur (this is sometimes termed the existential self or executive self).

The 'me' involves an understanding that we as individuals are known and evaluated by others (e.g. a naughty/good boy). This is also termed the categorical self.

The development of an understanding of self is a continuous process. As children's cognitive abilities develop, this permits a greater awareness of their own characteristics. In addition, for both children and adults, the self is continually changing along a large number of dimensions such as status, abilities and family relationships. As a result this awareness needs to be updated with the developmental changes that occur. Furthermore, the view of the self can feed into and motivate children's actions, which results in further change and development.

The self and identity

Indications of self and identity

Studies indicate that almost from birth infants have a preference for people or, to be more precise, the stimuli generated by people. Newborns show a marked interest in human faces or face-like stimuli (Kleiner and Banks, 1987). It is unclear whether this is a result of a general preference for stimuli that have similar properties to those of the human face (being symmetrical, containing eye-like stimuli and moderate degrees of contour) or whether this reflects an innate preference for the human face (Johnson and Morton, 1991). It would also seem that newborn infants will look for longer at faces that adults rate as being attractive than those rated as unattractive (Slater et al., 1998, 2000).

One way of explaining this preference for faces is that infants have some awareness that they are similar to people. In a fascinating study, Meltzoff and Moore (1977) showed that newborn babies could imitate adult models. The adults repeatedly stuck their tongue out, opened their mouth or pouted. Infants were significantly more likely to show similar facial movements to those they had just seen than the other types of movement.

To be able to do this, infants need to match the movements of someone else to the movements of their own body that they cannot even see. In a discussion of these and other findings, Meltzoff and Gopnik (1993) suggested that newborns recognise at some level that adults are 'like me'. Consequently, they can relate the movements they see to themselves. This is an interesting, if controversial, claim because it suggests that, from the very beginning of life, children have the ability to recognise that they share characteristics with other people and this could be considered a primitive form of the categorical self.

Trevarthen (1977) has also emphasised the communicative capacity of young infants and their recognition of the communicative abilities of other people. He believes that young infants act in a socially purposeful manner and appreciate some of the intentions of others – they have intersubjectivity. Trevarthen has described the way in which 2-month-old infants will move their limbs when interacting with their mother in ways that suggest a communicative desire. They will also move their lips and tongue in what he has called 'prespeech mouth movements'.

Thus some argue that, almost from birth, infants have an understanding that they share characteristics with other living things, particularly people. However, an alternative view is the 'hardnosed' interpretation, which maintains that infants' reactions are part of inbuilt automatic responses in the case of imitation or reflect levels of excitement in the case of prespeech movement. It is surprisingly difficult to devise ways to test these different interpretations.

Is there evidence for the early presence of the existential or executive self? Watson and Ramey (1972) found that not only could 2-month-old infants learn to turn their heads to one side to make a mobile move above their cot, but they also showed enjoyment at being able to do this. Infants in control conditions where head turning had no effect on the mobile did not show such pleasure. Furthermore, during an extinction phase when their actions no longer controlled the mobile, infants showed what appeared to be distress and frustration. These reactions suggest a sense of executive self, but we cannot be sure what is going on in these infants' minds, so again it is possible to adopt a more hardnosed interpretation which says that these are simply automatic responses.

There seems to be a change in infants' executive abilities at around 8 to 10 months, when they begin to solve problems in new ways, not simply by repeating past successes, but by taking new and 'indirect' routes. This is something Piaget described as involving new means to obtain an objective. Significantly, at this age infants appear to recognise that they can achieve their objectives through communicating with people (Bates et al., 1975).

For example, Bates et al. describe the way a young infant tried to tug a toy out of the hands of an adult without communicating with them, but when the child was slightly older (around 8 to 9 months), she made pleading noises and looked at the adult.

Infants at this age also appear to have a better idea of the distinction between themselves and others. They start to check adult interest or reactions. Such behaviour implies an awareness of the agency and importance of others. Examples of these behaviours are: social referencing (checking to see the reactions of others to an event), following the points and gazes of other people, showing objects to people and producing points to indicate their own interest (see Messer, 2003).

The ages of emergence of a number of these behaviours are significantly correlated, suggesting that they are part of the same cognitive system (Carpenter et al., 1998). Furthermore, as we will see in the next section, at between 8 and 10 months, attachment and separation become a significant feature of the infant's world (see Applications box 20.1). The beginning of an appreciation of the security provided by another or distress at her departure are likely to be associated with a new level of understanding of the infant's own agency in relation to other people (see Baldwin and Moses, 1996). There is also more direct evidence that there are changes in the categorical self at about this age. Lewis and Brooks-Gunn (1979) found that between 9 and 12 months infants look longer at pictures of themselves than at those of other infants.

Self-test: List the types of awareness of other people shown by infants younger than 12 months.

In older, 2-year-old children the majority (63%) are able to pick out photographs of themselves (Bullock and Lutkenhaus, 1990) and this figure rises to 97% by about 30 months.

Lewis and Brooks-Gunn (1979) also conducted a classic study that indicated another important change in the categorical self at around 20 months. Infants initially saw themselves in a large mirror for 90 seconds and very few touched their nose or face. Then the infants had their noses wiped and some red makeup was put on their noses. The infants were again put in a position to see themselves in the mirror: 12-month-old infants did not touch their faces despite their red noses; only a few 15- and 18-month-old infants touched their faces; however, the majority of 21- and 24-month-old infants touched their faces.

These findings indicate that the ability to recognise violations of one's own appearance occurs towards the end of the second year. More recent work by Povinelli et al. (1996) used stickers rather than red makeup. Instead of the mirror, the children saw pictures or video clips that had been taken a few minutes earlier. Children who were under 3½ years did not try to remove the stickers, but children older than this did. Povinelli et al. argued that the younger children had difficulty understanding that the pictures had relevance to their current appearance.

With older children, it is possible to ask them to describe themselves. Harter (1999) has concluded on the basis of an extensive body of findings that 3- to 4-year-old children typically talk about themselves in terms of concrete, observable characteristics ('I have brown hair'). They also tend to be optimistic about themselves and the future. Children in the early school years tend to make social comparisons with other children of a similar age (Frey and Ruble, 1985). Whereas, children between 8 and 11 years have a more integrated view of themselves, which accepts both strengths and weaknesses, and shows awareness of links between behaviour and social relationships (Harter, 1999).

The multicultural nature of modern western societies and the presence of disadvantaged minority groups have focused attention on the development of ethnic identity. The techniques used to study this are often similar to those used to study self-identity (toys, model dolls and photographs). Children above 4 years of age appear to be able to identify photographs of someone from their own ethnic group (e.g. Aboud, 1988).

Furthermore, between the ages of 4 and 7 years, black and other minority group children have been found to give a preference for white identities over their own. This has occurred when they are asked which group they would like to be similar to or with which group they would like to play. After the age of 7 children show a preference for their own ethnic group (Davey, 1983).

As one might expect, family and cultural influences can affect the nature of these responses. African-American parents who emphasised civil rights issues were found to have children who developed more positive attitudes to their own ethnic group (Davey, 1983; Milner, 1983).

Self-test: After 18 months, what are key milestones in the development of identity?

Identity and gender differences

Another aspect of self-identity concerns gender. Usually, the term 'sex differences' is used to refer to exclusively biological differences, such as the presence of a beard. 'Gender differences' is used to refer to differences that can be the product of biological and cultural experiences, such as boys being more aggressive than girls.

At around 2 years of age, about three-quarters of children identify pictures of boys or girls that match their own sex; by 3 years 90% of children identify the appropriate picture (Thompson, 1975). The ability of children to match a picture to their own sex indicates that they have an awareness of their gender identity. This is followed at about 4 years by an awareness of gender stability, where there is recognition that one remains the same gender across the life span. Following this is the achievement of gender constancy, with the recognition that gender remains the same although appearances may change, such as when a girl wears trousers or a boy grows long hair.

Many reports suggest that constancy is achieved at about 7 years, although it may be achieved earlier by those children who are educated about the nature of genital differences between children (Bem, 1989).

Considerable interest has been shown in the question of whether the differences that we see between males and females are the result of environmental or biological influences. The answer to this question has important implications for the way that we see ourselves and for the way that we might want children to be educated. It is clear that there are physical differences between the two sexes and that the sexes experience different levels of sex hormones such as testosterone and oestrogen. In terms of

Photo 20.1 Stereotypical behaviours of boys and girls.

biological explanations, it is supposed that these hormones form the basis of differences between males and females. After reviewing the evidence, Collaer and Hines (1995) suggest that the effect of male sex hormones is most apparent in activities like play, where the presence of male sex hormones is associated with more physical play and aggression.

Another explanation of gender differences involves social learning and social reinforcement. According to this account, girls receive reinforcement for stereotypically female activities and boys for stereotypically male activities. However, observation learning could also play a part (Bandura, 1969). Research findings indicate that adults appear to reinforce different behaviours with boys and girls. For example, observations of 2-year-old infants in their homes revealed that boys were encouraged to play with toy vehicles and discouraged from asking for help or playing with dolls. In contrast, girls were encouraged to play with dolls, dance and dress up, but were discouraged from jumping and climbing (Fagot, 1978).

Similar patterns are seen in older preschool children (Langlois and Downs, 1980). However, we should not assume that just because reinforcement occurs it is effective. Fagot (1985) also found that nursery school teachers rewarded quiet activities and discouraged physical activities equally in boys and girls. Despite this reinforcement of stereotypical female patterns, boys engaged in more physical play activities.

Some of the more recent work on issues connected with gender has tried to bring these different ideas together and has stressed that there are multiple influences at work. A good example of this is the work of Maccoby (1998, 2000), who has focused on the strong tendency of children to play with same-sex individuals. She discussed a range of influences from innate biological tendencies to the way social identity can limit interaction with the opposite sex.

Self-test: What explanations have been put forward about the causes of gender differences in identity? What methodological problems make it difficult to answer this question?

Self and others: attachment and relationships

Attachment

The previous section provided an outline of the development of children's ideas about the self and others. The topic of this section is the attachment relationship between children and others who are special to them. As we will see, attachment between children and their parents is a significant feature of children's lives. It is a topic that has been studied extensively by developmental psychologists.

Freud drew attention to the importance of first relationships to later development and believed that babies become attached to the people who feed them because of the associated relief from hunger. From a very different perspective, learning theory also explained attachment as being the result of the person who feeds infants becoming a secondary reinforcer through their association with the primary reinforcement of food.

During the 1950s and 1960s these assumptions were challenged by a number of research findings. An important landmark was an experiment by Harlow in which he provided two wire mesh cylinders for isolated infant monkeys. One cylinder contained a nipple so that the monkeys could obtain milk, the other was covered with towelling material (terry cloth). The views of Freud and learning theorists predicted that infant monkeys should show attachment to the wire cylinder because of the reinforcing properties of the milk. The opposite occurred. The monkeys spent more time on the towelling cylinder and, when scared, would jump back on this cylinder.

FOCUS POINT 20.1

Imprinting

The work of Lorenz and others on imprinting had an influential effect on thinking about attachment. An example of imprinting is newly hatched ducks following the first moving thing they see, and seeking security from this object when threatened. The first object a duckling sees is likely to be its mother, but in experimental situations imprinting can occur with bizarre objects such as watering cans. In the wild, imprinting increases the chances of survival as the ducklings can be defended by their mother and will stay close to her.

There is often a critical period for imprinting, a time after hatching during which certain experiences have to occur for there to be an effect on development. However, more recent research has suggested that there is greater flexibility over the time-frame than was previously thought and so the term 'sensitive period' has been used.

These findings indicate the importance of evolution in shaping attachment behaviour. They also show that developmental changes can occur relatively quickly if an organism is primed to learn something, and that primary reinforcement need not be involved in the process.

ACTIVITY BOX 20.1

Longitudinal studies of attachment

Bowlby's theory supposed that attachment security would become part of children's internal working model of their world. Thus, a secure infant would have a more confident approach to new situations than an insecure child. A number of studies have indicated that children's attachment classification is predictive of later characteristics.

Securely attached infants tend to be more cooperative with their mother during problem-solving tasks at 24 months (Matas et al., 1978), they are seen as social leaders by preschool teachers (Sroufe, 1983), are more positive at reunion with parents at six years of age (Main and Cassidy, 1988) and have a more positive self-concept at eleven years (Elicker et al., 1992). There are also indications that disorganised attachment predicts later aggressive behaviour and child psychopathology (van Farrar et al., 1999). However, it has also been found that attachment type changes even in the second year, with this often being related to changes in family circumstances (Vaughn et al., 1979).

Do these connections establish causation? What other explanations are there (think about the stability of parental characteristics)?

Another significant study was conducted by Schaffer and Emerson (1964). They also showed the *inadequacies* of reinforcement explanations. They followed up a group of Glaswegian infants and found that attachments were not always formed with people who provided care. Instead, children formed attachments to people who communicated and played games with them, even if these people were not associated with the process of feeding.

At this time Bowlby was formulating an alternative to learning theory. His ideas drew on findings from ethology, which is the study of behaviour from an evolutionary perspective (see Focus point 20.1).

Bowlby identified four phases in the development of attachment behaviours, although some of his descriptions have been superseded by more recent findings. For example, he identifies a first phase in which infants do not discriminate between different people. However, there is evidence that a very young infant will look longer at his or her mother's face (Bushnell et al., 1989), prefer to hear her voice (De Casper and Spence, 1986) and prefer her odour (Cernoch and Porter, 1985). These early preferences may be the result of familiarity – for example, a newborn's preference for his or her mother's voice appears to be the result of hearing her voice while in the womb. In addition, newborns prefer to hear their mother's voice when it has been transformed so that it sounds as it did when the infant was in the womb, rather than an undistorted recording of her voice (Fifer and Moon, 1989). These initial preferences are not, however, the same as attachment and young infants do not appear to be upset by separation. Indeed, research findings suggest that before 4 months of age, there is minimal behavioural disturbance by adoption (Yarrow, 1964).

The second phase that was identified by Bowlby (6 weeks to 6 to 8 months) involves preferences being shown for particular adults, such as the mother in terms of smiling, vocalising and being soothed. Clear-cut attachment was seen as developing in the next phase (7 to 18 months) when protest occurs at separation from particular people and infants show wariness of strangers. Bowlby believed that reciprocal relationships emerge between 18 and 24 months, when toddlers start to understand their caregivers' motives better and organise their own behaviour to mesh with that of the caregiver.

Self-test: How does the response of infants to their caregiver change in the first 18 months?

Although the development of attachment had been reasonably well described, in the 1960s there was a difficulty in assessing attachment relationships. A breakthrough came with Ainsworth and Bell's (1969) use of the strange situation (see Research methods box 20.1 and Activity box 20.1).

Doubts have been expressed about the validity of the strange situation (i.e. whether it provides an accurate assessment of attachment). For example, Kagan (1984) argued that it could be an assessment of temperament, avoidant infants being difficult to stress, while ambivalent infants were easy to stress. However, van IJzendoorn and De Wolff (1997) conducted a systematic review of published findings (a meta-analysis) and concluded that infants often have a different type of attachment to their mother from that to their father (i.e. an infant might have a secure attachment to the mother and an insecure attachment to the father). This suggests that attachment is more a feature of the relationship than a feature of infant temperament. If it were a feature of infant temperament, the children should have the same attachment to both parents.

There have also been worries that the strange situation is not valid in different cultures. Grossman et al. (1981) reported that 40–50% of German infants were avoidant and supposed this might be because of the value placed on independence in that country, although it should be noted that other studies have found percentages more similar to those reported in the United States and Britain. In Japan, Miyake et al. (1985) reported that 35% of infants were ambivalent and Takahashi (1990) drew attention to the possibility that 12-month-old Japanese infants might be extremely distressed in the strange situation because they

RESEARCH METHODS BOX 20.1

The strange situation

The eight episodes that make up the strange situation are as follows.

- Episode 1: experimenter takes caregiver and infant into unfamiliar room and caregiver brings the infant to a pile of toys.
- Episode 2: child and caregiver left alone in room.
- Episode 3: an unfamiliar adult enters the room, sits and reads, then starts to play with the infant.
- Episode 4: caregiver departs, leaving infant with unfamiliar adult.
- Episode 5: caregiver returns, unfamiliar adult departs.
- Episode 6: caregiver leaves again and infant is alone in the room.
- Episode 7: the unfamiliar adult returns.
- Episode 8: caregiver returns in the 'reunion episode'.
- Most episodes take three minutes.

Photo 20.2 Episodes in the strange situation. Source: Ainsworth and Bell, 1969.

A complex coding scheme is used to code behaviour so that infants can be classified in terms of the type of attachment that they show.

- Type A – Avoidant Infants: during separation from the caregiver there is little sign of distress; the infant does not interact or come close to caregiver at reunion.
- Type B – Secure Infants: infants sometimes show distress at separation; infants actively seek interaction and proximity with caregiver especially at reunion.
- Type C – Ambivalent Infants: at reunion, show both contact-seeking and resisting behaviours.
- Type D – Disorganised (introduced by Main et al., 1985): no clear pattern shown across the episodes, and bizarre responses to separation and reunion may be shown.

North American studies often report the following: 21 per cent of infants are avoidant, 67 per cent are secure and 12 per cent ambivalent. For statistical analyses, avoidant and ambivalent groups are often combined and termed insecure.

were seldom left alone by their mothers. Rothbaum et al. (2000) argued that such differences in attachment patterns between North American and Japanese samples indicate that the strange situation is not valid cross-culturally. Despite these concerns, the strange situation continues to be an important assessment of attachment.

Self-test: Can the strange situation be used to provide a measure of the strength of attachment? If it does not, what type of information does it provide about attachment?

Origins of attachment type

What causes different patterns of attachment? On the basis of Bowlby's views, Ainsworth et al. (1978) supposed that caregivers who were responsive to infant distress and demands would have secure infants, inconsistent responsiveness would result in ambivalent infants and a low level of response would result in avoidant infants. However, a meta-analysis by De Wolff and van IJzendoorn (1997) indicated that there is only a moderate relation between maternal behaviour and infants' later attachment type. It could be that the measures did not assess maternal responsiveness accurately or it could be that other variables are more important.

There are indications that maternal belief systems as assessed by the adult attachment interview (AAI) (Main et al., 1985) are related to infant attachment. The AAI involves a semi-structured, 1-hour interview, which is then transcribed and coded. The concern is not with the accuracy of the reports but with the coherence and attitudes

RESEARCH METHODS BOX 20.2

The adult attachment interview: classification of adult answers into four types of attachment

The four types of attachment are autonomous, dismissive, enmeshed and unresolved.

Autonomous

These adults can recall particular events in childhood and have a willingness to see the positive and negative features of experiences with their own parents. Adults who have this attachment type often have children of their own who are classified in the strange situation as securely attached.

Dismissive

These individuals regard the attachment processes between an adult and his/her parents as being of little relevance or importance. Individuals who have this adult attachment type often have children of their own who are avoidant.

Enmeshed

These people have difficulty distancing themselves from their parents. Adults who have this attachment type often have children who are ambivalent.

Unresolved

This is often the result of a trauma around the loss of a parent, in which the issues are still unresolved. Adults who have this attachment type often have children who are classified as having disorganised attachments.

expressed during the interview. The four main attachment types from the AAI are given in Research methods box 20.2.

A meta-analysis by van IJzendoorn (1995) revealed a strong relation between the way mothers were classified on the AAI and the way their infants were classified in the strange situation. The relation was even found between maternal AAI before the birth of her baby and later attachment type (Fonagy et al., 1991). This is an important finding because it largely eliminates the possibility that birth experiences or characteristics of the infant could have influenced the mother's responses in the AAI. It is also relevant that behavioural genetic studies indicate that attachment type is not a highly heritable condition (14% genetic, as estimated by O'Connor and Croft, 2001) and so the relationship between AAI classification and infant security is not a result of powerful genetic processes.

From the previous findings it would appear that there could be a tendency for cross-generational continuity. Maternal classification on the AAI is related to infant security of attachment. However, this does not always occur. A study of survivors of the Holocaust illustrates the way that attachment patterns can change across generations. Individuals who had experienced the terrible suffering of the Holocaust, usually with their family having been killed, were not surprisingly classified as 'unresolved' on the AAI. One would expect this pattern to continue into the next generation, but there was only a slightly higher percentage of unresolved individuals than would be expected and the next generation showed no difference in attachment patterns to those found in the general population. Thus the devastating psychological effects of the Holocaust did not appear to cause a downward cycle of psychological problems in subsequent generations.

Self-test: What features of a child's world help to predict the type of attachment they have to their caregiver?

Relating to others: helping and harming

Attachment is central to young children's relationship with a limited number of adults. However, children show both positive and negative behaviours with a wide range of people. Two examples of this are pro-social behaviour and bullying.

Pro-social behaviour

Pro-social behaviour involves helping, comforting and sharing. Empathy and sympathy are often seen as providing the basis for pro-social behaviour. Hay et al. (1981) report that 6-month-old infants show interest and attempts at intervention when a peer is distressed. Radke-Yarrow and Zahn-Waxler (1984) found that 10- to 14-month-old infants were disturbed by the distress of others. However, it is difficult to know whether these are examples of genuine empathy or more simple responses such as social contagion or imitation.

Responses are clearer around 2 years, when children are more likely to respond by comforting others than by becoming distressed themselves (Zahn-Waxler and Robinson, 1995). Between 2 and 3 years the frequency and range of pro-social behaviours increase to include sharing and providing assistance. However, it should be noted that pro-social behaviours are still relatively infrequent at these ages. Longitudinal studies indicate that there is continuity in the expression of pro-social behaviours between childhood and adolescence (Eisenberg et al., 2002).

Bullying

Bullying can be considered to be almost the opposite of pro-social behaviour. Olweus (1991) defined bullying as negative actions to others that occur repeatedly over time. Bullying can range from severe physical attacks to verbal name calling, teasing and taunting. Research has indicated that physical bullying is more common in boys and that

APPLICATIONS BOX 20.1

Attachment and separation

The short-term effects on young children of separation from parents, usually the mother, have been reasonably well documented. Many of these studies were conducted in the 1950s and 1960s when there was a lack of appreciation of the effects of separation. Bowlby observed that the short-term response of young children involved protest (crying and anger), despair (absence of play) and detachment (recovery of interest but detachment from parents/caregivers).

Films made by the Robertsons showed these short-term reactions in a boy who was separated when his mother went into hospital (Robertson and Robertson, 1971). In contrast, another child was prepared for the separation. She visited the Robertsons before the separation, took photographs of her mother with her and the Robertsons talked to her about her mother during the separation. The effects of separation on this child appeared to be minimal. Observations such as this have changed our awareness of the issues of separation, and hospital practice is now designed to ensure that young children do not have to be separated from their carers.

The separation of children from their parents during the Second World War raised concerns about the long-term effects of separation. Concern was increased by Bowlby's findings about a group of delinquent boys in London. Earlier in their lives these boys had often been separated from their mothers. Bowlby concluded that separation from the mother was largely responsible for their delinquency. However, later work by other investigators, and by Bowlby himself, involving careful comparisons between children who had experienced separations and other children, revealed that separations were not associated with later developmental problems. Instead it seemed more likely that the stress and chaotic lifestyles of some families were associated with the negative outcomes (Rutter, 1987).

One common cause of separation is parental divorce. Children's reactions to divorce appear to be related to their age when the separation occurs (Heatherington and Stanley-Hagan, 1999). Not unexpectedly, with increasing age children better understand the divorce process. Children in middle childhood often have recurring wishes that their parents will reunite, while adolescents often show more anger and shame, and are more likely to take sides with one parent.

Heatherington et al. (1982), in one of the first studies of this topic, compared young children with an average age of four years from divorced and non-divorced families. One year after their parents' divorce, children were more likely to exhibit emotional distress and behavioural problems than the comparison group. After two years, these differences had diminished, although some boys whose fathers had left continued to have poor relationships with their mothers and exhibited more anti-social behaviour.

Six years later, comparisons revealed that children whose parents had divorced had more independence and had a greater role in decision-making, although mother–son relationships continued to be problematic.

When interpreting these findings it is important to bear in mind that the extent and type of conflict between parents prior to a divorce may influence children's adjustment. Using the UK National Child Development Study and the US National Survey of Children, Cherlin et al. (1991) came to this conclusion after investigating the relationship between divorce, school achievement and behavioural problems. Furthermore, the impact of divorce is likely to vary from cohort to cohort as attitudes, incidence and support change from generation to generation.

relational aggression (spreading of rumours, name calling, influencing friends) is more common in girls (Crick and Grotpeter, 1995).

Wolke and Stanford (1999) suggest that about one in five pupils is bullied, with the incidence of the activity decreasing between 8 and 15 years. They also summarise the methods used in research on this topic, together with their advantages and disadvantages (see Research methods box 20.3).

Sutton and Smith (1999) have identified a number of different roles in the bullying process. These involve the bully plus an assistant and a reinforcer who yell and laugh. Children who bully or who are assistants are rarely victims but children who mainly adopt the reinforcer role are often both bullies and victims. Somewhat surprisingly, it appears that bullies are better at mind reading and similar tasks than other children (Sutton et al., 1999), whereas victims show the poorest performance in these types of task. Thus, the bullies appear to understand the thinking of others but ignore or distort the effects of their actions on other children.

Olweus (1992, 1993) has advocated a whole-school approach to reducing bullying, where all children are given guidelines about unacceptable behaviour and intervention occurs with whole classes as well as individual children. Olweus (1993) reports a 50% reduction in bullying for schools adopting the programme. Other studies, however, have not reported such dramatic improvements (Roland,

RESEARCH METHODS BOX 20.3

Methods of researching bullying in schools

Table 20.1 highlights some of the different methods available for researching bullying in schools.

TABLE 20.1 METHODS RESEARCHING BULLYING IN SCHOOLS

	ADVANTAGES	DISADVANTAGES
SELF-REPORT QUESTIONNAIRE	■ Whole-class administration (quick and economical) ■ Ideal for quantitative surveys ■ Anonymous (honest information) ■ Reliable	■ Differences in measures lead to varying frequencies ■ Reliance on reading and comprehension skills (not suitable for young children) ■ Self-perception bias
ONE-TO-ONE INTERVIEW	■ Can be used with young children ■ In-depth enquiry, e.g. reasons for bullying and attributions ■ Probing if inconsistent information is given	■ More expensive ■ Time-consuming ■ Cannot be anonymous (older children may not own up to being bullies/victims)
PEER-NOMINATION TECHNIQUE (children reporting on their peers)	■ Whole-class administered in older children (quick and economical) ■ Anonymous (honest information) ■ High re-test reliability	■ Time-consuming with young children (interview) ■ Liable to 'reputation effect' ■ Children talking about their nominations between each other
OBSERVATION TECHNIQUE	■ Offers qualitative detail that survey studies may miss ■ Captures bullying in social context	■ Expensive ■ Time-consuming ■ Observer effect/bias ■ Not useful for prevalence investigations (e.g. hidden bullying)

Source: Messer and Millar, 1999

1993, in Norway; Sharp and Smith, 1995, in the UK) and report that any effects appear to diminish over time (Eslea and Smith, 1998).

Self-test: Identify the strengths and limitations of different research techniques to carry out research into bullying.

Understanding others' minds: a cognitive approach

Interactions between people are very complex processes. Part of the complexity is that most of us are continually evaluating the other person in terms of their beliefs, feelings and desires. Quite often these beliefs, feelings and desires are different from our own and many of us find it an interesting challenge to try to understand what other people think and feel.

A considerable amount of research since the mid-1980s has been concerned with what has been termed children's theory of mind. This involves children's ability to understand that people can have different beliefs and representations of the world – a capacity that is shown by 4 years of age.

Theory of mind (TOM)

How can we tell whether young children have a theory of mind (see Research methods box 20.4)?

Origins of theory of mind

The ability to work out what another person is thinking is clearly an important aspect of both cognitive and social development. Furthermore, one important explanation for autism is that children with this condition do not have a

RESEARCH METHODS BOX 20.4

Theory of mind tasks

Wimmer and Perner (1983) devised a 'false belief task' to address this question. They used some toys to act out the following story.

Maxi left some chocolate in a blue cupboard before he went out. When he was away his mother moved the chocolate to a green cupboard. Children were asked to predict where Maxi will look for his chocolate when he returns.

Most children under four years gave the incorrect answer, that Maxi will look in the green cupboard. Those over four years tended to give the correct answer, that Maxi will look in the blue cupboard. The incorrect answers indicated that the younger children did not understand that Maxi's beliefs and representations no longer matched the actual state of the world, and they failed to appreciate that Maxi will act on the basis of his beliefs rather than the way that the world is actually organised.

A simpler version of the Maxi task was devised by Baron-Cohen et al. (1985) to take account of criticisms that younger children may have been affected by the complexity and length of the story in the task described above. The new task was the same in structure and involved two characters, Sally and Anne, and the location of a marble (see Figure 20.1). Again younger children gave the incorrect answer and older children gave the correct answer (although children were able to pass the Sally/Anne task at a slightly earlier age than the Maxi task). Further simplification of these tasks can result in even greater success in even younger children (Lewis and Osbourne, 1990; Mitchell, 1996).

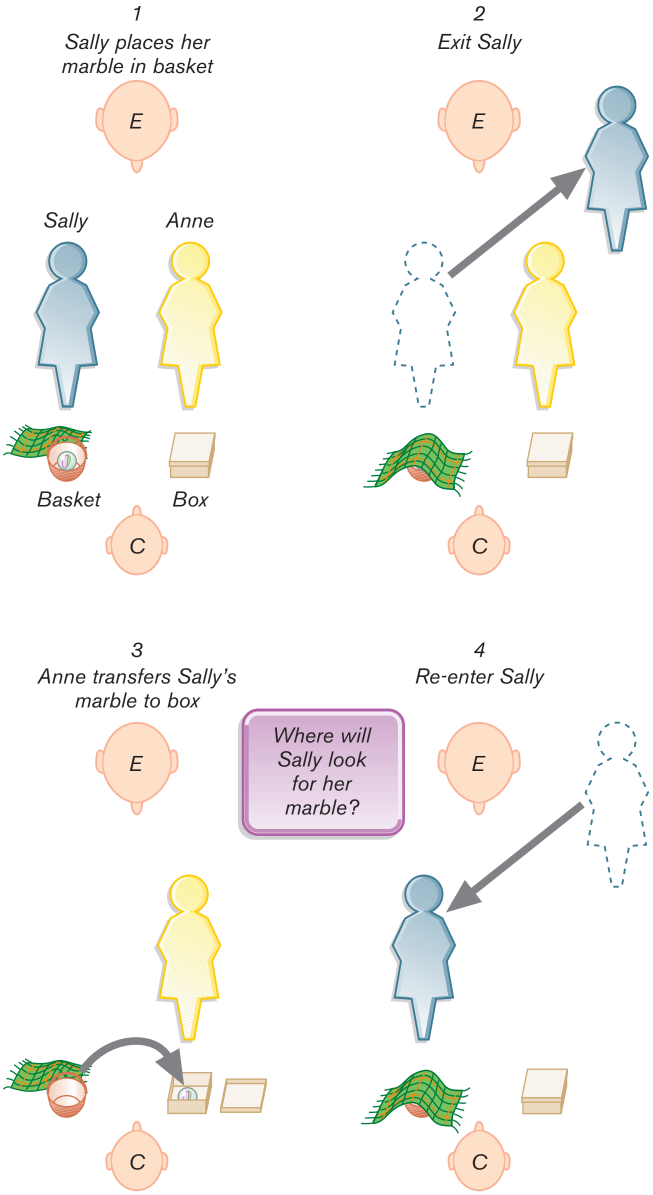
1
Sally places her marble in basket
E
Sally
Anne
Basket
Box
C
2
Exit Sally
E
C
3
Anne transfers Sally's marble to box
E
C
Where will Sally look for her marble?
4
Re-enter Sally
E
C

Figure 20.1 The theory of mind task

theory of mind (TOM). Consequently, the development of children's TOM has attracted considerable attention.

One set of explanations traces the development of TOM back to infancy. At around 9 months joint attention is a noticeable feature of interaction. This involves infants and adults attending to the same object or event. Hobson (1993) has argued that these triadic relations put infants in a position to notice that other people can have different emotional reactions to the world (the mother may find something funny that the child finds frightening). From these triadic relationships, infants begin to understand that they can construct more than one representation of an entity.

A more cognitive explanation of this process has been proposed by Baron-Cohen (1993). He suggested that infants are born with a module that processes information about the direction of other people's eye gaze: the eye direction detector (EDD). At around 6 to 9 months the EDD begins to be able to note where the self and another person are looking, in a triadic relationship involving two people looking at an object (or event). In this way, children develop the ability to form two different representations (their own and those of the other person) about an object or event. This forms a basis not just for monitoring gaze, but also allows infants to start to process information about mental states like interest, attention and so on.

Both Hobson and Baron-Cohen suppose that these triadic relationships where there are two different representations provide the basis for the later development of pretend play which also involves having more than one mental representation of the same thing. Pretend play involves object substitution (e.g. a banana is used as a pretend telephone), giving false properties to objects and things (e.g. 'teddy is tired') and pretending that an object is present (e.g. pretending to eat).

Self-test: What are 'triadic relations', and why are they thought to be important for the development of thinking?

In relation to pretend play, Leslie (1987) argues that, before 18 months, children treat the world in a literal way and rarely demonstrate pretence. He also argues that it is necessary for the cognitive system to distinguish between what is pretend and what is real. If children were not able to do this, they would not be able to distinguish between imagination and reality. Leslie suggested that pretend play becomes possible because a decoupler copies primary representations to make secondary representations. For example, when children are pretending a banana is a telephone, they would make a secondary representation of a banana. They would manipulate this representation and they would use their stored knowledge of 'telephone' to build on this pretence.

Being able to play pretend games might not at first seem to have much relevance to understanding the mind of others. However, both processes involve metarepresentations, which means being able to create thoughts (i.e. representations) about things that are different from what is happening in the world.

There is evidence that social processes have a part in the development of TOM. Meins and her colleagues have found that what they term mindmindedness in maternal speech to 6-month-old infants is related to both security of attachment and to TOM abilities (Meins et al., 1998; Meins et al., 2002). Mindmindedness involves speech that discusses infants' feelings and explains their behaviour in terms of mental states (e.g. 'you're feeling hungry').

Lewis et al. (1996) investigated older children living in extended families in Crete and Cyprus. They found that children who socially interact with more adults, who have more friends and who have older siblings tend to pass TOM tasks at a slightly earlier age than other children. Furthermore, because young children are more likely to talk about their thoughts and feelings with peers than with their mothers, peer interaction may provide a special impetus to the development of a TOM (Brown et al., 1996).

A similar point has been made by Dunn (1999), who argues that peer interaction is more likely to contain pretend play and that it is likely to be more challenging because other children, unlike adults, do not make large adaptations to the communicative needs of other children.

Self-test: What experiences might help the development of a theory of mind?

A number of researchers have argued that children can understand quite a lot about other people's minds before the age of four. After all, infants will point to objects apparently in an effort to change a person's direction of gaze and interest (Tomasello, 2007); they can interact quite effectively with other people; they will express their ideas in opposition to the wishes of others; and they will show empathy for the feelings of others. All this suggests that they have some level of understanding that their own thoughts are different from those in another person's mind.

Experimental and observational evidence to support this position comes from a variety of sources. When a card with a different picture on each side is shown to a child and to an adult sitting opposite her, 3 year olds understand that they can see a different picture from that seen by the adult (Masangkay et al., 1974).

Schatz et al. (1983) studied the spontaneous speech of 3-year-old children and found that these children used mental terms and used them in circumstances where there was a contrast between, for example, not being sure where an object was located and finding it or between pretending and reality. Thus the social abilities of children indicate that they are aware of the difference between mental states and external reality at ages younger than 4. What changes to enable children to pass TOM tasks? Wellman (1990; Wellman and Gelman, 1998) claims the change involves children's theory about other people. He suggests that 2-year-old children have 'desire' theory about people, because they assume that desires will influence behaviour. For example, children of this age were told a story about Sam, who was looking for his rabbit so he could take it to school. Some children were told that he found his rabbit, some were told he found a dog. All the children were asked whether Sam would go on searching or whether he would go to school. Both groups gave the appropriate answer. This indicates that even young children who do not pass TOM tasks appreciate that others can have different desires depending on the circumstance.

However, children of this age give incorrect answers to the following story. They were told that Sam thinks a puppy is under the porch, but that the puppy is actually in the garage. When asked where they think Sam will look, they said in the garage and so did not appear to take account of Sam's belief. Wellman suggests that 3-year-old children progress to a 'belief–desire' theory about people. They can understand people's belief if it corresponds to the state of the world, but still have difficulties with TOM tasks.

It is worth noting that a further explanation has been put forward by Harris (1989). He proposed that children use 'simulation'. This involves putting yourself in the other person's position and then trying to predict what the other person would do. Thus success on false belief tasks can be explained by children trying to imagine what they would do if they were a character in the stories, rather than children being able to appreciate the beliefs of other people. Such thinking about situations that do not exist involves what is termed counterfactual reasoning (Harris, 2000).

FOCUS POINT 20.2

The triad of impairments in autism

1. **Impaired non-verbal and verbal communication**
    - Delayed or absent speech
    - Inability to initiate and sustain conversations
    - Stereotyped and repetitive speech

2. **Impaired social relations**
    - Failure to develop peer relations
    - Lack of spontaneous sharing of enjoyment
    - Lack of social and emotional reciprocity

3. **Restricted, repetitive and stereotyped behaviours**
    - Unusually intense interests in restricted topics
    - Adherence to rituals
    - Stereotypes and repetitive motor movements
    - Persistent preoccupation with parts of objects

The theory of mind explanation of autism

We have just seen that there are various explanations for the development of TOM. In addition, over the last 20 years a considerable research effort has been devoted to increasing our understanding of autism. One explanation that has been central to this work is that children with autism fail to develop a TOM. Before we discuss this, it is useful to outline the characteristics of children with autism. Autism was first described in the 1940s by Kanner (1943), who was working in Chicago, and by Asperger (1944), working in Austria. Wing (1988) has proposed that autism involves a triad of impairments (see Focus point 20.2).

Many, but not all, children with autism also have low scores on intelligence tests. Some have areas (islets) of ability such as drawing, music or the ability to perform calculations. Often, symbolic and pretend play is absent or restricted (Libby et al., 1989). Over half of children with autism do not acquire language (Bailey et al., 1996). In addition, many children who can speak will echo back speech they have heard (*echolalia*) and will also reverse personal pronouns, using 'you' when they mean 'I' or 'me'. However, it is important to emphasise that autism involves a range of abilities and characteristics.

In 1985 Baron-Cohen and his colleagues gave the Sally-Anne task (see Research methods box 20.4) to a group of children with autism and a group of children with Down's syndrome. Both groups were similar in terms of their general abilities and both had higher abilities than a typical 4- to 5-year-old children. So these children would be expected to pass the task. About 80% of the children with autism failed the Sally-Anne task, but most of the children with Down's syndrome passed.

A subsequent study by Leslie and Frith (1988) confirmed these findings with a real-life task. One experimenter put a coin under a cup, then another experimenter who had been present left the room and the coin was moved under another cup. Children with autism gave incorrect answers to the question 'Where will Uta [the second experimenter] look?' They thought she would look where the coin was now positioned.

Baron-Cohen (1993) has suggested that these findings indicate that children with autism have mindblindness, due to the failure to develop a theory of mind module (TOMM), and this can be traced back to a failure of shared attention mechanisms (see page 292). More recently, Baron-Cohen has taken this argument further by suggesting that autism is a form of extreme male thinking associated with the amygdala region of the brain. This involves an obsessive interest in some topics and a lack of appreciation of social processes.

The presence of mindblindness helps to explain a number of characteristics of autism but there are some difficulties with this explanation. For one thing, only about 80% of children with autism fail TOM tasks and an absence of TOM fails to account for the repetitive and stereotyped behaviours of these children. Other competing explanations have been put forward (see Activity box 20.2).

Section summary

In this section, we have seen the way that research into children's theory of mind has:

- produced new methodologies
- involved discussion about the way this ability develops
- provided an explanation for the characteristics of children with autism.

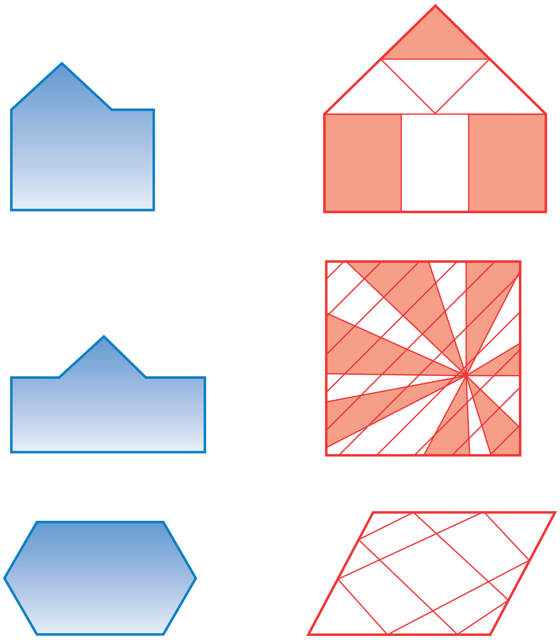

Figure 20.2 The embedded figures test

ACTIVITY BOX 20.2

Executive functioning, central coherence and autism

Adults who have had damage to the frontal lobes of their brains have been described as having difficulties with *executive functioning*. This involves inflexibility in action plans. For example, on the Wisconsin card sorting task, which involves picking out cards with particular characteristics, patients with frontal brain damage have difficulty changing their strategy when asked to pick out cards with a different set of characteristics. In addition, these patients are often socially unresponsive or insensitive to social cues.

Ozonoff et al. (1991) drew attention to the similarities between high functioning individuals with autism and patients with executive functioning deficits. A dramatic illustration of these difficulties has been shown in a 'windows task' used by Russell et al. (1991). The main part of this task involves two boxes, one of which contains a sweet. If children point to the empty box they can have the sweet. Children with autism have considerable difficulty inhibiting their response.

Another explanation of autism is that the children have a difficulty with *central coherence*. This view has been put forward by Frith and Happe (1994). Central coherence refers to the ability to identify the relationship between separate items of information, and Frith and Happe believe it involves a style of thinking rather than a primary deficit. A number of studies show that children with autism have superior performance to typical children on tasks where there is an advantage in not being able to 'see things as a whole'.

In the embedded figures test (see Figure 20.2), children have to pick out a shape that is hidden in a picture. Children with autism are better at this task than children of a similar cognitive ability (Shah and Frith, 1983).

Happe (1994) also found that children with autism, who could read and had passed TOM tasks, had difficulty using contextual information. Some words have the same spelling but are pronounced in different ways (e.g. a tear in a cloth and a tear in an eye). Children with autism, unlike typical children, had difficulty using information provided in the rest of a sentence to pronounce these words correctly.

Another finding related to central coherence is that when children with autism draw something they start with detail and then build up a complete picture. In contrast, typical children start with the overall shape of what they are drawing and then fill in the details. Thus there is a range of findings that support the idea that children with autism have 'weak' central coherence.

How well do you think TOM, executive functioning and central coherence explain the following characteristics of children with autism?

1. Lack of pretend play
2. Inability to lie
3. Lack of communication
4. Repetitive and stereotyped behaviours
5. Failure on TOM tasks

Don't read the following two paragraphs unless you want help in answering these questions.

The executive functioning explanation is consistent with a range of characteristics of children with autism (e.g. not inhibiting incorrect answers in TOM tasks, not inhibiting inappropriate social behaviours). However, there are also problems with the theory. Surprisingly, patients with frontal lobe damage do not have impaired TOM.

Another problem is the finding that children with PKU have impaired executive functioning but not an impaired TOM (Welsh et al., 1990). Thus it would seem that impaired executive functioning does not always result in an impaired TOM.

The false photograph test also creates problems for this theory. In this task the children are shown a camera, which is used to take a photograph of a scene. The scene is changed and the child is asked about what the photograph in the camera will show. Children with autism can respond correctly, and therefore seem able to inhibit a response in these circumstances. However, they cannot answer correctly in TOM tasks when asked about what is in a person's mind (Leekham and Perner, 1991; Leslie and Thaiss, 1992).

Central coherence theory can be used to explain a lack of TOM, as children with autism fail to see the wider implications of situations in assessments such as the Sally/Anne task. In a similar way, central coherence theory can be used to account for the difficulties of children with autism in dealing with social situations and pragmatics. It can even account for the obsession that some children with autism have for order (e.g. arranging toys in a line) and for detailed knowledge about some aspect of the environment (e.g. makes of car), because they fail to take a more general perspective.

There are criticisms of this theory, however, for example, Jarrold and Russell (1997) reported no difference in the analytic skills of children with autism and children with learning disabilities. Another criticism is that the predictions of central coherence theory are not particularly clear when it comes to deciding the type of task children with autism will find difficult, so that explanations tend to be *post hoc*.

Self-test: List the research studies and theories relevant to the three points summarised on page 295.

Adolescence: new relationships

Biology, culture, storm and stress

Adolescence is a period of changing views about the self, changing relationships, and a greater sensitivity to the views of peers. While there is no generally agreed definition of adolescence, most definitions include some aspect of biological maturation, an increasing adoption of adult roles and a transition from childhood to adulthood. Deciding when adolescence ends is especially problematic in western cultures as there has been an increase in the age at which conventional adult roles are adopted (such as the age at which people start to have a regular income from employment).

The biological changes of adolescence enable individuals to engage in functional sexual relationships. These biological changes are well known and involve the development of the sexual organs, the beginning of menstruation or the capacity for the ejaculation of sperm, the development of secondary sexual characteristics (pubic hair, breasts and deeper voices) and then a growth spurt that often signals the ending of increases in height.

Lack of appropriate nutrition is associated with delays in the age at which these biological changes take place. Furthermore, in countries where there are large disparities in wealth, those in higher social classes are likely to reach puberty at younger ages (Katchdourian, 1977). Puberty also appears to have occurred at progressively younger ages over the last century. Records from Finland and Norway indicate that the age of *menarche* (the first menstruation) declined from about 16 years in the 1860s to about 13 years in the 1960s (Tanner, 1973; but see Bullogh, 1981). These effects are usually regarded as being caused by better nutrition and healthcare and, possibly, by smaller family sizes.

There is evidence that an earlier onset of puberty relative to other individuals has consequences for psychological development. A study by Magnusson et al. (1985) in Sweden found that girls who mature earlier, in comparison to those who are late maturing, tended at 14 years to be more involved in drinking alcohol, taking illegal drugs and missing school. Part of the reason for this seems to be that the early-maturing girls mixed with older adolescents who were more likely to engage in these activities.

A follow-up of these individuals at 25 years revealed that those who matured early were more likely to have married and to have had children and less likely to have continued with their education. The general pattern of these findings has been supported by other studies in various countries (Silbereisen and Kracke, 1997). In the case of boys, it would appear that those who mature early tend to feel more positive about themself, be popular and do well at school (Silbereisen and Kracke, 1997). This is probably because of their strength, size and sporting abilities, features that tend to be valued by peers.

Is adolescence a period of storm and stress?

Freud's theory of development suggested that adolescence is an especially difficult time because of the emergence of biologically based sexual motivations. He believed that these disrupt the equilibrium achieved during childhood.

A different explanation has been that the transition between the roles in childhood and adulthood is responsible for the difficulties of this age group (e.g. making decisions about new relationships, careers and responsibilities). It has also been suggested that these difficulties are particularly common in western societies because of the ambiguous status of adolescents (i.e. countries often specify different ages at which sexual intercourse, drinking alcohol, driving, entering the army and voting are legal) and that this increases uncertainties about roles and responsibilities. This can be contrasted with other cultures where ceremonies mark the transition from childhood to adulthood and after the ceremony has taken place the person is treated as a member of the adult community. It is also worth pointing out that the view that adolescence is a period of storm and stress coincided with the period of adolescent rebellion in the 1960s and 1970s.

It has been suggested that part of the reason for any storm and stress is the generation gap between adolescents and adults, particularly parents. Many studies suggest that adolescence involves a change in the orientation, from the family to the peer group.

However, studies also indicate that for many young people this transition is not necessarily a difficult one. For example, in one of the first studies of this topic, Rutter et al. (1976) used questionnaires and interviews to collect information from parents and adolescents on the Isle of Wight. Most parents (five-sixths of them) reported that they did not have arguments about matters such as their children going out or their activities, although one-third said that there was conflict over clothing or hairstyle (remember this study was conducted when there was a marked change in youth culture and appearance). Similarly, only about one-third of the adolescents made criticisms of their parents during the interviews.

Another significant study was conducted by Coleman (1974), who asked adolescents to complete a sentence such as 'My friends are . . .'. This technique is likely to obtain responses that reflect current concerns and attitudes. The analysis of the answers revealed that, in general, anxiety and fear of rejection by friends increased from 11 to 15 years, but declined around 17 years. Similarly, a longitudinal study conducted by Galambos and Almeida (1992) revealed that conflict with parents about chores, appearance, politeness, finance and substance abuse declined with the increasing age of the adolescents.

Research into the more general issue of storm and stress has not usually shown adolescence as a period of

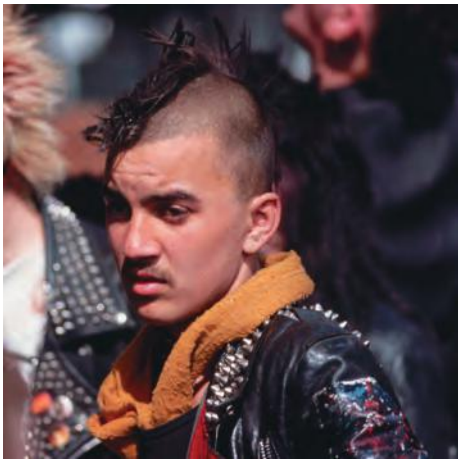

Photo 20.3 Adolescent appearance and identity. What are these adolescents communicating about their identity?

widespread difficulty for all individuals at all ages. Instead, Coleman (1980), in his focal theory, suggested that difficulties occurred for some individuals at some times. Evidence to support his view came from questionnaires and interviews with adolescents (see Coleman and Hendry, 1999).

Issues of identity

As we saw earlier in this chapter (pages 284–7), identity increases in complexity with age. Harter (1999) has shown that in adolescents this process continues. Adolescents, in comparison to children, use more abstract terms when describing themselves. They also recognise that they act differently in different circumstances and with different groups of people. In addition, Harter describes the way that during adolescence there is an increasing integration of these different perspectives and that there is less dependence on the views of others.

Adolescence is also different in that it is a period when individuals are able to make choices about a coherent identity, but when there can also be difficulties in achieving this. Erikson, who worked within a psychoanalytic framework, proposed that this is a major issue facing adolescents (Erikson, 1959, 1968). He described a number of different states that occur during the identity formation process. One involves adolescents trying out different types of identity involving such things as politics, religion, choice of career, appearance and so on; and to some extent adults were tolerant and expected changes of this nature. Erikson termed this a *psychosocial moratorium*.

Other states identified by Erikson concern identity diffusion, where individuals have not yet experienced a crisis; identity foreclosure, where there has not been a crisis and the identity promoted by others is accepted; and identity achievement, where the crisis is resolved. Erikson pointed out that adolescents sometimes choose a negative identity, which is the opposite to that of a parent or another member of their family. In such cases, the adolescent will dress, act and have attitudes that are the opposite of this person.

Marcia (1966) investigated these ideas by carrying out interviews about attitudes to politics, religion, careers and sexual behaviour. He found that the responses corresponded to Erikson's description of the different states of adolescent identity. More quantitative research has documented the way that the percentage of individuals who achieve a coherent self-identity increases across the adolescent age range (Meilman, 1979). Other research has revealed that the failure to achieve a coherent identity is associated with a lack of intimate relationships, being apathetic and being more likely to engage in drug abuse (e.g. Grotevant, 1998). In contrast, those who are experimenting with identity (moratorium stage) tend to have high self-esteem and anxiety, but are also likely to have experimented with drugs (e.g. Jones, 1992).

Self-test: List important psychological issues that are present during adolescence. Is it a time of storm and stress?

CLASS ACTIVITY BOX 20.1

Revision

A review session can be conducted. Depending on the size of the group, ask students before the class to read through their notes and handouts to identify at least one topic about which they were unsure or that they don't understand (if you prefer, the focus of the activity could be just this chapter). Ask students to bring all their notes and handouts to the class. During the activity, ask students to identify problem areas and see if other students can try to explain the topic. This can be done in small breakout groups or as a whole-class exercise.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Define self-identity and describe its development.
2. Discuss the influences on the formation of attachment.
3. Define theory of mind and discuss its development.
4. Compare theories about the causes of autism.
5. Evaluate whether adolescence is a time of storm and stress.

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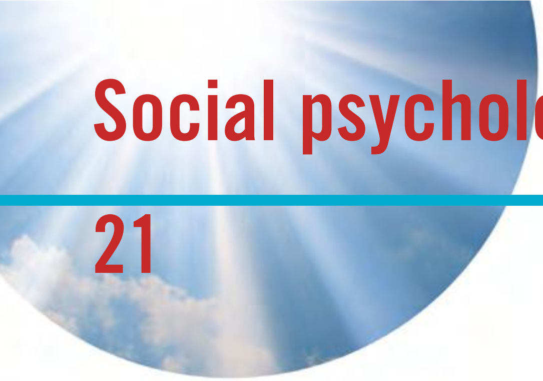
sectionfive

Ian P. Albery

Social psychology

21 Issues and themes in social psychology 302
22 Attitudes, persuasion and attitude change 315
23 Attribution 333
24 Impression formation and social interaction 345
25 Social influence and group processes 362



Social psychology

21

Issues and themes in social psychology

Route map

The aim of this chapter is to provide you with a basic introduction to the various themes and issues that are important for the study of social psychological processes. Our starting point will be to look at how social psychology has been defined and the historical basis to these definitions. The next part of the chapter focuses on two approaches that social psychologists take in their studies. The first is the experimental approach. We shall see that the main proponents of this approach are those who come from a social cognition perspective. The second approach is called critical social psychology; we will focus on one perspective – social constructionism – from this school. We then move on to study the types of experimental and non-experimental research method and strategy that social psychologists use, and the ethical considerations that this work involves.

Introduction

Social psychology is the field of psychology that is to do with how we think about other people and how we interact with other people or interact in groups. It is a subdiscipline of general psychology. Over the years a number of definitions of social psychology have been offered (see Focus point 21.1).

Social psychology

You will see throughout this section that the sorts of question social psychologists have been interested in answering are designed to understand how people or groups of people interact, and the results of those interactions. Social psychologists are concerned with the social world in which people and groups coexist. They are also interested in how people think about and behave in their social worlds.

Social psychology is concerned with people's thoughts, feelings, intentions, goals, beliefs and attitudes, as well as their behaviour. For instance, in Chapter 22, we will come across the idea of attitudes as a concept for understanding how we and others behave towards each other. In Chapter 23, we will look at how people explain their own behaviours and those of others. Chapter 24 is concerned with how we form impressions of others and interact with others, while Chapter 25 looks at how groups of other people affect our own thoughts and feelings. These areas are all key aspects of understanding our social world and together form the bulk of what social psychology is about.

FOCUS POINT 21.1

Defining social psychology

'. . . the scientific field that seeks to understand the nature and causes of individual behaviour and thought in social situations' (Baron and Byrne, 2003: 5).

'Social psychology is all about the give-and-take of influence – on behaviour, beliefs, and feelings – between individuals, between groups, and between an individual and a group' (Carr, 2003: 3).

'. . . the scientific investigation of how the thoughts, feelings and behaviour of individuals are influenced by the actual, imagined or implied presence of others' (Hogg and Vaughan, 2002: 2).

As social psychologists we study behaviour because behaviour can be 'seen', but we also study beliefs, intentions, feelings, attitudes and so on, which can't directly be 'seen'. We can infer these from people's behaviour and they may be important for predicting how a person will behave in social situations. These are the psychological dimensions of social behaviour. As we shall see in this chapter and in the chapters that follow, some social psychologists try to relate these dimensions to more fundamental cognitive or thinking processes. In other words, they are interested in those processes that occur within the human mind.

Self-test: What is social psychology?

A brief history of social psychology

Where does social psychology as a discipline come from? The earliest influence came from German folk psychology, or Völkerpsychologie, in the 1860s. The psychologists involved in this movement were interested in what they called 'group mind', or 'the collective mind', which basically described the ways in which societal thinking is reflected in the individual. This approach was the main way in which people understood social behaviour in the late 19th and early 20th centuries. For instance, LeBon (1908) used this approach to try to understand why people behave differently in crowds.

Experimental work in social psychology, and the adoption of empirical methods derived from behaviourist principles, really began in 1898 with Norman Triplett's work on competition and social facilitation (see Chapter 25) in which cyclists were shown to ride faster when competing with others. For many, however, the 'father' of experimental social psychology is Kurt Lewin, who founded a research centre at the University of Michigan, in the United States, in 1945 to study group processes. Some of his work looked at the role of leadership in group behaviour.

Many influential experimental studies were carried out in the first part of the 20th century. These include the work of Leon Festinger, Soloman Asch, Muzafer Sherif and Carl Hovland, to name but a few, and focused on areas like impression formation, attitude change, attribution and group processes.

It seems, therefore, that although the foundation of social psychology can be attributed to the European scholars, the Americans soon took over leadership in the discipline. However, the second half of the 20th century saw a rapid rise in influence on the part of European social psychologists, particularly in the area of group processes and social influence. These particularly influential psychologists include Henri Tajfel and Serge Moskovici.

While all this work has been dominated by experimental approaches, more recently some Europeans have adopted a more critical approach to social psychology by questioning the empirical assumptions of the experiment (e.g. Gough and McFadden, 2001; Potter and Wetherell, 1987; Stainton Rogers, 2003).

Self-test: How did social psychology develop as a discipline?

Key paradigms in social psychology

We now turn to the key paradigms that are of contemporary importance in social psychology. Specifically, we are going to look at experimental social psychology (and social cognition as the main paradigm associated with it) and social constructionism.

Social cognition

Social cognition developed from theories and ideas from general cognitive psychology (see Chapters 12 to 16), except that the emphasis was specifically on our experience of the social world. In a landmark publication, Susan Fiske and Shelley Taylor (1991) outlined the main assumptions behind the social cognition approach (see also Fiedler and Bless, 2001). They argued that people should be seen as active thinkers who use complex cognitive strategies to bring meaning to their experience in the social world.

Social cognition is that part of social psychology that looks at how people perceive their social worlds. It is concerned with how we attend to, store, remember and also use information received about other people and ourselves. Social cognition researchers are interested in understanding the types of systematic cognitive strategy that people use in this process. We will come across examples of work that adopt the social cognitive approach in this chapter and those that follow. We will also see that much work that pre-dated Fiske and Taylor's proclamation is really social cognitive accounts. These include attitude work (Chapter 22), attribution work (Chapter 23), impression formation work (Chapter 24), and also work on group processes and social influence (Chapter 25). For now, though, let's look at some of the key assumptions of social cognition.

People as naive scientists

The idea of the naive scientist is derived from Heider's (1958) 'common-sense psychology' and is discussed in Chapter 23 on attribution. The basic idea here is that we use various strategies to understand why we and others behave in particular ways in certain social situations. From this viewpoint we are viewed as rational decision makers. Heider (1958) argued that individuals need to be able to form a coherent view of the world around them and at the same time achieve control over their environment. This desire for consistency, stability and control effectively makes us all naive scientists. People test hypotheses we have about how we and others behave in our social environments. In effect, we work out causes for particular events or make attributions in predictable ways.

People as cognitive misers

This idea basically argues that people are exposed the whole time to a barrage of information that needs processing. To do this we would probably need heads the size of small planets to give us the necessary processing space. Nisbett and Ross (1980) introduced the term cognitive miser to describe the idea that people have limited cognitive resources available to them and therefore use all sorts of shortcuts to cope with incoming information (see also Taylor, 1991).

One example here is the use of stereotypes in forming impressions of others (see later in this chapter), and other forms of heuristic processing or using general 'rules of thumb' in decision making (see Chapter 16). A number of heuristics are used by people in their everyday lives to make decisions, form impressions, etc. One example is called the representativeness heuristic (Kahneman and Tversky, 1973). This is the tendency for people to assign attributes to other people if these attributes match a prototype stored in memory. Another example is the availability heuristic (Kahneman and Tversky, 1973). This is the tendency for an individual to base his/her judgements of the frequency of an event in their environment on how easily they can bring to mind examples of that event. If, for instance, you have been involved in a number of car accidents and are asked to make judgements about how likely you are to be involved in another accident in the future, it is likely that you will think your chances are increased relative to someone who has not been involved in an accident. Why? Because you can bring to mind or access specific examples of being accident involved and this affects your risk judgements (see McKenna and Albery, 2001). The false consensus effect is a specific thinking bias that is explicitly related to the availability heuristic and is presented in Chapter 23.

People as motivated tacticians

Kruglanski's (1996) social cognition account sees people not so much as cognitive misers or naive scientists but more as motivated tacticians. Social thinking is seen here as more strategic than limited. So, for instance, a person can actively select from a number of available strategies based on the needs, goals and motives of the thinkers at that time. People are quite flexible in the thinking strategies they use and base their use of these strategies on their current needs or motives. At times people think in complex ways, requiring significant cognitive effort, and at other times in less effortful ways, relying on cognitive shortcuts like heuristics. According to Macrae et al. (1993) a number of factors determine under which conditions a person will use fewer or more complex processing strategies. When people are short of *time*, or are having to think about or process a lot of information (high in cognitive load), they will use heuristics. When the decision we make is high in *importance* for the individual, they are more likely to use more complex processing strategies. On occasions when we do not have sufficient *information* to allow for more complex processing, we will revert to heuristic processing. This idea of the person as a motivated tactician is the other side of the coin to being a cognitive miser or naive scientist.

Given that these main assumptions propose that various processes are important for understanding the thinking social being, let's now look at a few examples of these processes. We are going to restrict ourselves to categorisation, schema and an example of these processes in action: stereotyping.

Self-test: Describe the key assumptions of social cognition.

Categorisation and schema

Cognitive social psychologists argue that the way in which meaning is given to information being received is through categorisation. Categorisation itself describes the idea that we classify similar things together and treat them as a discrete category. These categories are stored in our long-term memory. For instance, the category 'footballers' includes David Beckham, George Best, Maradonna and the like, but it will also include people who are specific to the individual perceiver, such as those people who play five-a-side with you and so on. Figure 21.1 gives an example of how football as a category can be organised hierarchically. Think of categorisation as a type of heuristic process.

In addition, these categories can have other attributes associated with them. For instance, when we think about footballers we may well associate them with being 'stupid', 'spoilt' or even 'attractive'. However, these types of trait can also be appropriate to other categories and may also form a category in their own right.

For instance, you may well be asked to recall anything that is associated with the concept of being 'spoilt' and recall not only footballers but also other people. This shows that we do not necessarily represent categories as being completely independent of one another.

There are also connections between different social categories. This is called an associative network (Fiedler and Bless, 2001). These associative networks describe how categories are related semantically and give meaning to our social world. For instance, categories that share many features and have quite similar meanings are closer and more strongly connected than more dissimilar ones. For example, when we think about the category 'footballer', related categories (e.g. 'rich people', 'stupidity', 'being male', 'aggression', 'unintelligent' and so on) are also all closely connected (unless you are a footballer!). Fiedler and Bless (2001) give a nice example of an associative network involving categories related to being a feminist (see Figure 21.2).

In associative networks the links between the categories are organised in a semantic way. For example, if you were to think of the category 'feminist', other related categories would also be thought of (or activated), on which we may base attributions for events or behaviours or the impressions we form of others.

But why do we use this categorisation process when making social inferences? First, categorisation allows us to do more than one thing at the same time. It frees up processing capacity. Second, it provides a way of giving meaning to our social worlds. Categorising the behaviours of others allows us to predict social behaviours through creating norms on which we 'know' ourselves and others (Hogg, 2002).

Fiske and Taylor (1991) adopted the concept of schema from cognitive psychology (see Chapter 14) to describe how

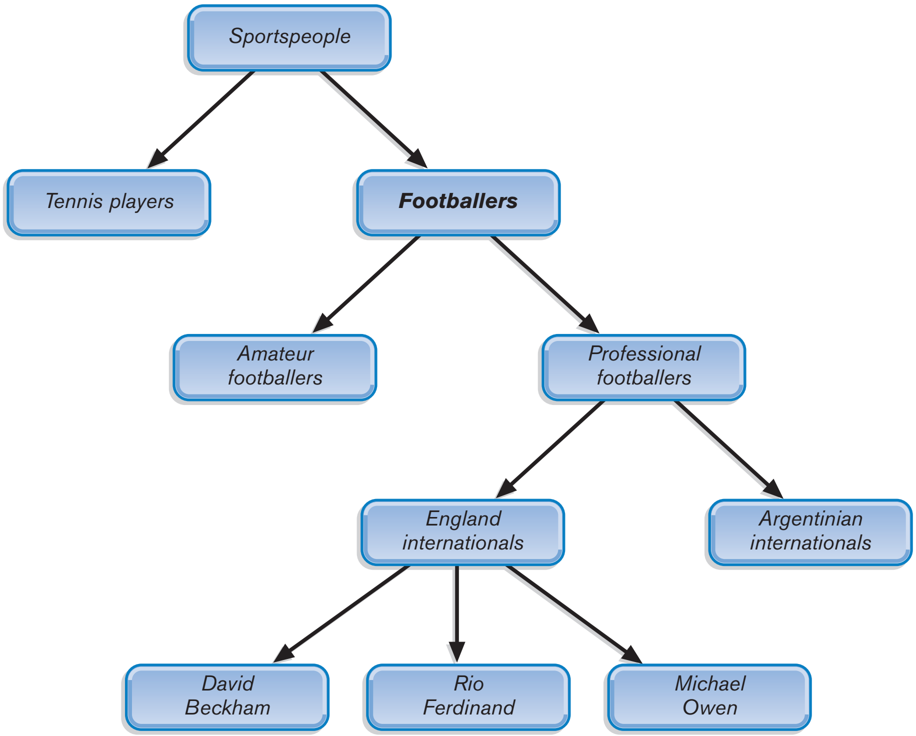

Sportspeople
Tennis players
Footballers
Amateur footballers
Professional footballers
England internationals
Argentinian internationals
David Beckham
Rio Ferdinand
Michael Owen

Figure 21.1 Hierarchical representation of how the category 'footballers' is organised

social knowledge is represented in our heads. A social schema is a cognitive structure that represents our knowledge about something in our social world. This representation includes the attributes of the stimulus and also the relationship between these attributes. Schemata are based in memory and are dependent on past experience with the stimulus. They may also form the basis for making judgements about social objects.

In essence, these schemata are 'shorthand summaries of our social world' (Pennington, 2000: 69). A number of social schemata have been identified over the years, including person schemata, self-schemata, role schemata and event schemata (see Focus point 21.2).

Self-test:

- What is categorisation and how do people categorise social events?
- What types of social schema do people use?

Stereotyping

Before you read this section, have a look at Class activity box 21.1.

What sort of words did you write down to describe a librarian? These words will, to some extent, form the basis of a stereotypical image you have of a librarian. The main point here is that it is highly unlikely that every librarian

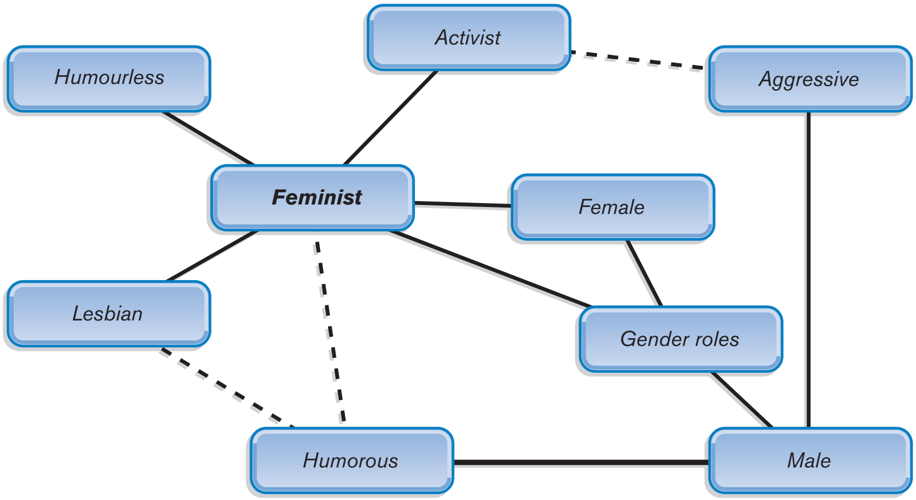

Activist
Humourless
Aggressive
Feminist
Female
Lesbian
Gender roles
Humorous
Male

Figure 21.2 Associative network of categories related to being a feminist

FOCUS POINT 21.2

Types of social schema

Person schemata

These are expectations about other people based on past experience with them and knowledge about them. For example, it is likely that we have all built up over time a detailed person schema for a close friend. Among other things, this is based on the behaviours we expect of that person, their beliefs and attitudes, and possibly their personality type. The types of schema we have might also govern how we behave towards that person or towards other people in the presence of that person. We can also have schemata that characterise our ideal person. These are called prototypes. These contain the ideals, beliefs, behaviours etc. we expect of that person.

Role schemata

These schemata represent knowledge we have of the roles we play in different situations. For example, we all have an idea of the roles we have in lectures, in an interview, in a restaurant or even at a football match. They are expectations of how we should behave that come into play when we are in a particular context. In other words, they are the roles we play in different contexts. For example, you as readers of this book are likely to have a student role schema that acts to predict the way you behave when you are at college or university.

Self-schemata

These guide how we process information related to ourselves. Certain characteristics are defining for each human being and these help to define the self. For instance, you might hold particular beliefs or opinions that help define the self; these are called ‘schematic’. We also know of other possible characteristics that are not useful for defining the self; these are called ‘aschematic’.

Event schemata

These refer specifically to representations we have of what we normally expect in a whole host of situations. For example, we would have an event schema for going to the pub or for being in a lecture and so on. They are also called scripts.

CLASS ACTIVITY BOX 21.1

The stereotypical librarian

For the next minute write down as many words as you can that describe a librarian.

I hope you didn’t find this very taxing. What sorts of characteristics did you identify as relevant to being a librarian? Did you include personality-based traits like shyness, introversion or being boring? What about more external characteristics like the way they dress? For example, did you write down the word ‘glasses’? Now swap your list of words with another person in your group. Discuss the similarities and differences between the words you wrote down and those of other people in your group. Is there an overlap in the types of descriptor that you and others wrote down? Did certain common descriptors appear earlier in the lists than others?

Getting you to write down this word list was designed to show you that we all have characteristic, or stereotypical, beliefs about others. The fact that other people report the same or similar characteristics shows how generalised these beliefs are. Also, getting you to write down the words as quickly as possible and within a small timeframe hopefully got you to write down the first things that came to mind – in other words, the traits most easily retrievable or accessible from memory about what a librarian is like.

will be exactly the same. People are different from one another. Not all librarians are boring and shy! (See the accompanying photo.) So the *stereotypes* we have of certain people or groups of people might not be accurate.

Our social schemata, of which the stereotyping process is an example, lead to errors and bias in inferences. They might even guide the way we behave towards people. An extreme example here is prejudice and discrimination (see Chapter 25). In general, stereotypes are generalisations that a large number of people have about particular social groups (Brown, 2000a; Macrae et al., 1994).

Evidence suggests that stereotypes act in an automatic manner (see Biernat and Billings, 2003). For instance, on encountering a librarian you are likely to infer that they are ‘boring’ and ‘shy’ because your ‘librarian’ stereotype or schema has been activated without your having control over it.

Some studies have shown that you may well behave in accordance with the stereotype that has been activated or is chronically accessible. For instance, Bargh et al. (1996) got participants to form sentences from a series of scrambled words. One group was asked to form sentences that included a word related to being elderly (e.g. shoes give replace *old* the) and another group was asked to form sentences that did not include an old-age-related concept (control group). Participants in the first group were subsequently shown to walk more slowly than those in the

Photo 21.1 Does this match your stereotype of a librarian?

control group. When debriefed, the participants were not aware that they had been primed with the scrambled sentences. The idea was that being presented with the words had activated, or cognitively primed, the old-age stereotype and resulted in a behaviour change. Other work has demonstrated automatic racial stereotyping at work (e.g. Lepore and Brown, 2002) and also that it is very difficult to suppress stereotype activation (see Applications box 21.1).

In general, most of the work that has applied a social cognitive account of how people understand and interpret their social worlds has attempted to establish general causal laws for behaviour through controlled experiments. Social cognitivists argue that there is a predictable and objective reality in the world that is observable through experimentation (Augoustinos and Walker, 1995; Fiske and Taylor, 1991). What if these types of assumption are not thought of as being totally valid? Some social psychologists are now questioning these types of assumption. One of these is a critical social psychological approach called social constructionism.

Self-test: Define the stereotyping process.

Social constructionism

As an approach, social constructionism has its roots in work undertaken by Gergen (1973) and Berger and Luckmann (1967). The basic idea is that because social life is ever changing, all we can try to do is to ask how the world looks at the point in time at which we are looking at it. For social constructionists, any knowledge we have of the social world is created (or constructed) by language, culture and history (McGhee, 2001).

The way in which we understand the world does not show how the world really is. That is to say, experiments do not reflect objective reality. Reality is argued to be constructed by people in their everyday interactions. For social constructionists, experiments do not allow for context to play a role. To understand human behaviour and existence you need to study what people say, in what contexts, and take into account the person's personal history as well as your own (Gough and McFadden, 2001). An example of this is discourse analysis, which is described later in this chapter.

Social constructionists have criticised 'scientific' or experimental social psychology as being too positivistic. Positivism is the non-critical acceptance that science is the best and only way to arrive at a true understanding of what is going on in the social world. It is argued that because, ultimately, social psychologists are actually studying themselves, because they are interested in human behaviour and experience, they cannot be totally objective in their interpretations of behaviour. Because psychologists cannot be objective, then the scientific methods that have been used in experimental social psychology can be questioned.

Some would argue that social psychology can at best only pretend to be an objective science. It can never be a true science in the sense that chemistry, physics and biology are (see Stainton Rogers, 2003; see also Chapter 5 of this book).

We have already seen in our look at social cognition – and will also see throughout all the chapters in this section on social psychology – that experimental social psychology is based on a number of core processes. These are virtually laws and give reasons why we behave in predictable ways. These processes describe how our perception of the social world around us uses *cognition*, or thinking, to guide the behaviours we produce. These processes include causal attribution, categorisation (how people organise and think about information perceived from the social world) and attention (how people may selectively seek out certain information to guide behaviour and interpretation).

Social constructionists, and other critical social psychologists, argue that these fundamental processes are only estimations or approximations to explain observations that are biased by our own lack of objectivity. Also, they argue that the scientific approach acts to dehumanise people by considering them as objects that are manipulated in the experimental setting.

So social constructionism seeks to understand people as whole human beings that are constructed by the historical and cultural context within which they exist. Experimental methods and quantitative data analysis are not useful in understanding the 'real' constructed person because they are too objective. Social constructionists therefore rely on more qualitative approaches (see the section on discourse analysis, below) that allow more in-depth and subjective accounts of how people think, feel and behave.

They believe that language is central to understanding the constructions people hold about their social worlds. For them, language is not just seen as a communication tool for

APPLICATIONS BOX 21.1

Can we suppress stereotypes?

There are occasions when we deliberately try to remove unwanted thoughts from our minds. Every one of us has been in the situation when we really wanted to tell somebody what we thought of them but were able to resist. On other occasions have you actually said something that you hadn't intended to say? Can we suppress our stereotypical thinking when interacting with others? Macrae et al. (1994) undertook two studies to examine this issue. They were interested in the effects of suppressing stereotypes on stereotypical thinking (Study 1) and also actual behaviour (Study 2).

In Study 1, people were presented with a photograph of a male skinhead and told to spend a few minutes writing a paragraph describing a day in the life of that person. Before doing this, however, people were either asked to actively try to avoid thinking about the person in the photo (*suppression condition*) or were given no instructions (*control condition*). After this people were asked to write a second paragraph about a different male skinhead but this time were not given instructions to either suppress or not. Figure 21.3 shows the results of this experiment. The dependent variable was the degree of stereotypical language used in the production of the stereotypes.

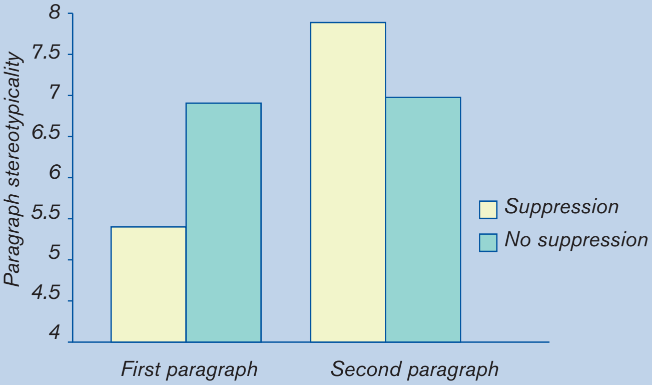


Figure 21.3 Writing stereotypically after suppression of stereotypes

It is clear that those asked to suppress their stereotypes in the first paragraph did so quite effectively compared with control participants. However, when asked to write a paragraph about another similar person in the second paragraph (after having not been given any instructions), suppressors reported significantly more stereotypes in their paragraphs. In other words, suppressors seemed to show more stereotyping than other people when they were not trying to suppress their stereotypes towards a male skinhead.

Study 2 took this finding and asked the question: Does this suppression effect have any implications for how we respond to members of the stereotype group? Participants again were given a photograph of a male skinhead and asked to either suppress their stereotypes or not while writing a paragraph about that person. This time, however, they were then taken to a room and told that they would meet the skinhead they had seen in the photograph (although this was not really going to happen). In the meeting room were eight chairs arranged in a row and on the first chair were a bag and jacket which, the participants were told, belonged to the person in the photograph. They were then asked to sit down and make themselves comfortable. The dependent variable here was how far away from the bag and coat belonging to the skinhead they would sit. Figure 21.4 shows that those who had been asked to suppress their stereotypes when writing the paragraph sat further away from the skinhead's belongings than those given no suppression instructions. In effect, they were showing more discriminatory behaviour towards the hypothetical skinhead.

So what do these findings tell us? Macrae et al. argue that to suppress a stereotype we have to use cognitive resources to assess our thinking, which actually has the effect of making the stereotypes increasingly accessible for us. This results in our becoming even more stereotyped in our thinking and behaviour. In other words, trying to suppress our stereotypes results in our becoming even more stereotyped.

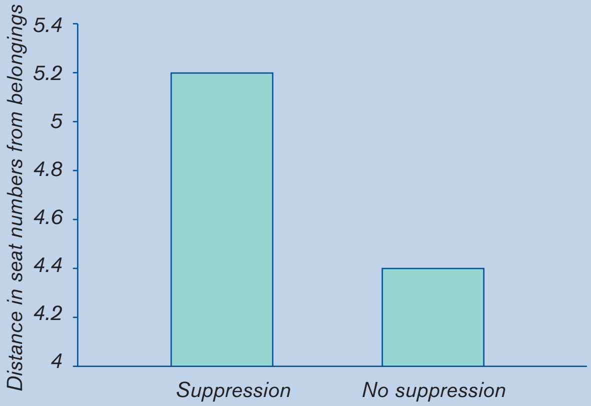


Figure 21.4 Behaving stereotypically after suppression of stereotypes

conveying our feelings and thoughts, it is an action that performs the role of helping with the construction of the social world.

Self-test: What is social constructionism?

Research methods in social psychology

In this section, we will take a brief look at the numerous methods that are used in social psychological studies. As you will have seen in Chapter 3, psychologists have traditionally adopted the scientific method. You will also have seen that this scientific method involves us stating precise predictions, or hypotheses, about how one variable affects another.

Social psychology is no exception to this rule. If we see social psychology as a science then there are broadly three types of research method that are employed (see Manstead and Semin, 2001). These are descriptive research, correlational research and experimental research.

Descriptive research

This approach is concerned with getting an accurate description of behaviour. The question we ask is, 'Does behaviour X happen?' For instance, in Chapter 25, you will come across Stanley Milgram's work on obedience to authority (e.g. Milgram, 1974). The question he initially asked was, 'How many people would obey orders from an authority figure?' To get an answer to this he observed people in a situation in which they were asked to deliver electric shocks to other people. Milgram's answer was that about 65% of his participants were completely obedient to an authority figure's request. But why? To go some way to answering this 'why?' question, social psychologists use either correlational methods or experimental methods (see also Chapter 39).

Correlational research

The question we ask here is, 'Is variable X related to variable Y?' If we use the Milgram example again here, the question could be, 'Do those people who obey orders from authority figures tend to be a particular type of individual?' For instance, we may be interested in finding out whether introverts are more likely to obey than extroverts. So the question we are asking is, 'Is there an association or relationship between personality type and obedience to authority?'

While finding relationships between variables is a useful step in helping psychologists to understand why two variables may correlate, such work is limited because it does not allow us to see whether one variable caused another. For this we must turn to experimental work.

Experimental research

This type of research is designed to get to the cause of observed phenomena. Using experiments, social psychologists see what happens to one measured variable when they deliberately manipulate other factors in the environment. The question we ask is, 'By changing variable X (the independent variable), will there be a change in variable Y (the dependent variable)?' For example, you may be interested in finding out whether people on average make riskier decisions when they are in a group of people than when they are alone (see Chapter 25). You might, by way of contrast, be interested in seeing whether 'scaring' smokers with information about the risks of continuing smoking – like telling them that their chances of dying from lung cancer are significantly increased – changes their beliefs about smoking and the likelihood that they will give up (take a look at the attitude change and persuasion sections in Chapter 22). In this second example, we're asking the question, 'Are smoking-related beliefs and actual smoking cessation changed when a smoker is given information about the health risks of continuing smoking?'

Throughout this section on social psychology, you will come across many examples of the experimental approach in operation. For instance, you will see work from Asch (1956) in Chapter 24 that looked at whether first impressions count in impression formation.

Having looked briefly at the types of research approach that social psychologists use, let's take a look at some of the important research strategies that are used in these approaches.

Self-test: List the main research methods in social psychology.

Research strategies in social psychology

The types of research strategy used by social psychologists can be divided broadly into two types: experimental and non-experimental methods.

Experimental methods

Social psychologists use laboratory-based experiments and field experiments. Laboratory-based studies enable the researcher to control many potentially confounding variables when looking at the effects of manipulating one variable (the independent variable) on another variable (the dependent variable).

For instance, we may want to look at the effects of an audience on how a person performs on a task. To do this, we would get a person to do the task under conditions where they were being watched by others or were alone (see Chapter 25). Task performance is the dependent variable and the presence or absence of an audience the independent variable. If all other confounding variables are controlled for in the laboratory, by comparing performance levels between the audience and no audience conditions we can see whether or not a difference in performance is dependent on being watched. Laboratory experiments are useful because they let us claim that one variable *caused* an effect in another.

Field experiments are those that are undertaken outside the laboratory in the 'field', or the real world. In these circumstances, not as many confounding variables can be controlled for and the exact relationship between variables is more difficult to claim. We could do the audience experiment in the field. We could go to a gym and observe how people behave under conditions of being alone on a treadmill as compared with being watched by the experimenter or any number of other people.

Non-experimental methods

In some instances, either it is not possible or it is inappropriate to use an experiment to test a particular idea or hypothesis. For example, some variables cannot be manipulated so that we can see their effects on other variables. We cannot change a person's gender, for example, if we are interested in looking at the effects of gender on exposure to media violence.

In the same vein, at times we cannot manipulate particular variables for ethical reasons (see the section on this later in the chapter). For instance, it would not be ethically correct to expose people to a violent attack from somebody else because we wanted to look at what effect this would have on levels of self-esteem, depression or anxiety.

It is for this reason that social psychologists also use non-experimental methods in their research. These include survey research, archival studies and field studies. On the whole, these approaches do not allow us to claim that one variable caused an effect in another. This is because non-experimental methods do not involve the manipulation of one variable and testing its effect on another variable. The best we can usually do is claim that there is a relationship between the variables being studied (i.e. a correlation).

Survey research

Survey research is a widely used tool for acquiring data. Just think of the number of times you have been approached on the street and asked if you would mind spending a few minutes answering questions about this, that or the other. Think too about the numbers of occasions you have seen this or that public opinion poll in the media, showing so many people are in favour of whatever.

These are examples of survey research. To get the data, researchers either ask people directly about their opinions and note down the answers that are given, or else the respondents are asked to fill in a questionnaire containing a number of items relevant to the topic area. The questions people are asked are not just plucked out of thin air – the survey instrument has usually been through an intensive pilot phase so that the researchers can be fairly sure that the questions they are asking are relevant to the issue they are studying. People's verbal responses might even be recorded so that the researcher does not have to note everything down.

The important point about survey research is that the people asked to answer the questions (known as the *sample*) are representative of the population from which they are drawn. For example, it would not be representative if the only people asked about whom they were going to vote for in the next election were young when we know that they make up only a small proportion of the population as a whole. The researchers would not be able to claim that the sample opinions were representative of the true population picture.

Archival research

This involves researchers using data and information gathered by others in the past to study the question they are interested in. This sort of data can involve diaries and media accounts (from the television, radio, the newspapers and so on), as well as biographies about events or even autobiographies of people involved in events.

In Chapter 25, you'll come across an example of this approach in action. We'll look at how Janis (1982) used other people's reports and also media reports of events surrounding various situations in which groups had made disastrous decisions, in developing his theory of groupthink. As you will see when you read Chapter 25, groupthink describes which factors are important for describing the circumstances important for group decision making in stressful situations.

Field studies

Field studies involve the observation and recording of naturally occurring events and behaviour. For instance, we might want to look at how people behave while drinking alcohol. So we go to a pub to observe and record how people are behaving. Compare this to the field experiment, in which we manipulate one variable and see its effects on another. In the field study, there is no manipulation of variables.

As we have seen, some people question the idea that social psychology is a science and, as such, is accountable to the laws of science through experimentation. If we seek to understand the 'true' nature of human behaviour by trying to understand people as whole human beings, and not as the by-products of experimental manipulations, we need to adopt a more in-depth qualitative approach for research. Qualitative methods allow researchers to focus more on the qualities or characteristics of a person's behaviour.

With the continuing interest in social constructionism as another approach to understanding social psychology, researchers have been using other techniques in designing and analysing their studies. These include grounded theory, conversation analysis and the Q method (see Stainton Rogers, 2003), although the most widely used is discourse analysis.

Discourse analysis

Discourse analysis was developed by Jonathan Potter and Margaret Wetherell (1987) and involves the detailed analysis of language that is provided from a number of sources. These include the texts of interview transcripts, newspaper and other media articles and even the transcripts of people in conversation.

This approach does not try to test causal predictions or hypotheses. The idea is that the person using discourse analysis provides a 'reading' or 'interpretative account' of the text or conversation. Of course, the researcher's account itself then becomes a source of text for the next discourse analyst! Discourse analysis allows the researcher to study how talk is used to manage interactions between people.

Discourse analysis has a number of aims, as described in the following.

Isolating the interpretative repertoires of discourse

Interpretative repertoires are the types of metaphor and image we use in everyday talk to construct an object. According to Wetherell, these interpretative repertoires are 'sets of recurrent and coherently related stylistic, grammatical and lexical features . . . including metaphors . . . and figures of speech' (1997: 162). For any object in our social world, there will be a range of these repertoires that we can and do use. In addition, the same person can use these repertoires in contradictory ways depending on the context of the interpersonal situation, including the goals that people bring to their interactions.

An example of the types of repertoire that people may use about a particular issue is given by McGhee (2001). He identifies two repertoires that may be used when discussing 'students in higher education'. One interpretative repertoire is that students are lazy, always drunk, drug crazed, left wing, irresponsible and enjoying 3 years of loan-funded clubbing. Another is that students are poor, brainy bookworms who struggle day in and day out to make ends meet, while keeping up with university assessments and assignments. These repertoires may be used by the same person discussing the category 'students' and, as you can see, can be contradictory.

Looking at how rhetorical actions are achieved in talk

When discourse analysts talk about rhetorical actions they mean those that are used for communicating and persuading when interacting with another. So, for example, the use of blaming, justification and presenting information as fact are all examples of rhetorical actions.

The most common use of discourse analysis is with interview transcripts between a researcher and a participant or group. For example, Reavey and Gough (2000) were interested in the subject of childhood sexual abuse. They interviewed 10 counsellors, therapists and psychiatrists and studied how their discourses reflected how female abuse survivors were seen (see Applications box 21.2).

Whatever the approach we take in designing and running studies that involve trying to understand how people think, feel and behave, we need to be aware of a number of ethical issues. It is to this area that we will turn now.

Self-test: Describe experimental and non-experimental research strategies used by social psychologists.

APPLICATIONS BOX 21.2

Therapists' constructions of women survivors of childhood sexual abuse

The extract below is taken from interview transcripts reported by Reavey and Gough (2000). In this study they interviewed ten professional therapists, such as psychiatrists, counsellors and clinical psychologists, on the area of childhood sexual abuse. The study aimed to explore how female abuse survivors were positioned in professionals' discourses in terms of sexuality and also femininity.

Take a look at the transcript example below. Remember that the researcher and the participant are discussing the female abuse survivors.

The following is an extract of part of the interview between the researcher and a clinical psychologist called Oliver.

Oliver: I think always, think the choice of partners often fascinating.

Researcher: Right, why?

Oliver: So often they choose a partner who will in turn abuse them in some form.

Researcher: Right.

Oliver: Cos it's like, it's almost like kids build up some kind of internal working model of um the environment still being abusive in some way, and I think in some unwitting way also [women] seek that out, it's like that's what you know . . .

In this extract women survivors of childhood sexual abuse are constructed by Oliver as making illogical or irrational choices of partner. In fact he constructs these women as recreating the abusive scenario in their choice of partner.

Ethics in social psychology

When doing social psychological studies we have to take account of a number of ethical issues. For example, is it right or ethical to put people into a situation in which they may feel uncomfortable or that might lead to longer-term suffering? Is it ethically sound deliberately to deceive a study participant?

An often cited example here is Milgram's work on obedience to authority, which is dealt with in some detail in Chapter 25. Another example is the infamous prison study (the 'Stanford prison experiment') undertaken by Philip Zimbardo and his colleagues on social roles and power in social situations (Haney et al., 1973) (see Focus point 21.3).

The results obtained from both Milgram and Zimbardo's work are important because they spawned a great deal of interest in obedience, conformity and power relations. (You may recall that Zimbardo's study was replicated in a

FOCUS POINT 21.3

Zimbardo and colleagues' prison study

Participants were recruited for the study through newspaper advertisements. They were told that they were needed for a study of prison life and that the study would last for two weeks. In total, 24 males were accepted on to the study. They were all emotionally and physically healthy. They did not have any criminal convictions and had not been in trouble with the police. In other words, they did not differ very much in their personal characteristics.

In the summer of 1971 the basement of Stanford University's psychology department was converted into a mock prison. The idea was to recreate the prison environment as closely as possible so as to look at the impact of prison life on people who live or work in prison.

The participants were randomly assigned to be either a prisoner or guard in the simulation. The experiment began with the arrest by local police of those who would be portraying prisoners. The participants were not expecting to be arrested like this. Think, though, whether this part of the experiment is ethically sound. Should people be subjected to something they are not expecting in this way?

Having been arrested the participants were charged, searched, handcuffed and taken to the police station. From the police station they were then taken, still handcuffed and now also blindfolded, to the mock prison.

On arrival at the prison they were stripped naked, searched again, deloused and issued with standard prison clothes. They also had a chain placed around one of their ankles. The prisoners were only referred to by their prison numbers, which were on the front and back of their uniforms. The guards wore standard uniforms and carried clubs, whistles, handcuffs and keys.

The prison was guarded all day, every day by the guards, who worked eight-hour shifts. The guards had complete control over the prisoners. One point to remember is that none of the participants had been told or instructed how to behave – they were just given the role of either prisoner or guard.

It wasn't long until the guards became quite abusive and aggressive towards the prisoners, who themselves became very passive. After 36 hours one prisoner had to be released because he was showing signs of being very affected by the experience. He cried uncontrollably and seemed to be depressed. Another three of the prisoners were also released over the next few days for similar reasons. The prisoners were completely demoralised. It was no surprise that after six days the experiment was halted.

The important point about this study is that it showed the effect of a situation on how a person behaves and how roles can easily be adopted. Do you think you would have behaved as the guards did? If not, why not?

television show on British television in 2002 (see Reicher and Haslam, 2002).)

When undertaking social psychological studies we are guided by a number of ethical principles, as described later. (For a broader view of ethical issues in psychology generally, see Chapter 36.)

Protection of participants from harm

This includes both physical and mental harm. We should design our studies so that people participating in them are not subjected to any form of physical or mental harm. At times this is very difficult to achieve. For example, getting a person who has been involved in a serious road accident and then asking them about the accident could lead that person to feel anxious or a bit 'down'.

The act of recalling the accident itself could be in some way harmful. One way to help reduce this effect is to debrief the participant fully (see later).

Right to privacy

Many social psychological studies involve situations in which a person's privacy is to some extent invaded. Examples here include studies that observe people without their knowledge or that ask very intimate questions. The question we need to ask ourselves is whether the research aims justify this invasion of privacy. For example, asking people about committing an illegal act, like drink-driving (Albery and Guppy, 1995), is fundamental if we are to understand what motivates these people to behave in the ways they do. To get around the problem of privacy we ensure that any information we get from participants is completely confidential. No one knows who said what, who ticked which box on a questionnaire or who responded in a particular way to a computer-generated task.

Photo 21.2 Two images from Zimbardo's prison experiment.
Source: Zimbardo, 1992.

Deception

To avoid bias in responding, people taking part in experimental research are usually not told what the hypotheses of the study are. Experimenters sometimes do not say what the true nature of an experiment is. People are deceived. With the odd exception (such as Milgram's obedience work) most social psychological studies involve trivial deception. For example, social influence studies might be advertised as being studies to do with group decision making.

Informed consent

Before the study people should be asked to consent freely to taking part in it. This means that they are provided with full information about the study so that they are in a position to make their consent in an informed way. Also participants are assured that they can withdraw at any point from the study. Theoretically, this is all fine. However, in practice it is not always that clear what 'full information' means. For example, some studies might require that the person is not told about the precise study aims or is deceived in some way.

Debriefing

This is a very important ethical principle. After finishing the experiment people should be told about the experiment, what was expected and what the significance of the work they have just taken part in is. This full debriefing can be quite time consuming but is fundamental, especially in those studies that have involved any sort of deception.

Self-test: What are the key ethical principles used in social psychological research?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe how social psychology has been defined.
2. Describe and evaluate the historical background to the study of social psychology.
3. Critically assess a number of paradigms that have been developed in the general area of social psychology.
4. Describe how social cognition as a scientific account is consistent with or differs from social constructionism as a critical account.
5. Describe key experimental and non-experimental methods used in social psychology.
6. Evaluate the role of ethical considerations in the area of social psychology.

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3 How do social psychologists study social behaviour?

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22

Attitudes, persuasion and attitude change

Route map

The aim of this chapter is to present you with an overview of attitudes, persuasion processes and attitude change. Initially, we will explore how the term 'attitude' has been defined, what functions attitudes serve, how attitudes are structured, how they develop and how we measure them. We then move on to look at the relationship between attitudes and behaviour and at what psychologists know about how attitudes change. Finally, we look at how people may be persuaded to change their attitudes and, theoretically, their behaviour.

Introduction

Unlike some psychological terms, attitude is part of our everyday or commonsense language. We try to explain our own and other people's behaviour towards another person or issue in terms of our own or others' attitudes towards that person or issue.

For instance, ask yourself why so many people demonstrated against the war in Iraq in spring 2003. What could account for the fact that millions of people took to the streets in London, Paris and cities across the world? Your answer is likely to focus on the types of attitude these people had towards the war in Iraq or conflict in general. You might explain the demonstrators' behaviour by saying that 'the marchers had a negative attitude towards the war, they were anti-war and pro-peace'. It is this sort of language we use when talking about our own and other people's attitudes (see Activity box 22.1).

Attitudes have been of interest to social psychologists for many years. Some have argued that social psychology as a discipline is really the scientific study of attitudes (Watson, 1930). The prominence of attitudes as a theme was highlighted as early as 1935 when Gordon Allport commented on the importance of attitude work (see Focus point 22.1).

In this chapter, we look at a number of key questions about attitudes (see the following list), and the theories and evidence behind these questions:

1 How do we define attitudes? How are attitudes structured? Are attitudes made up of distinct and predictable psychological components?

STOP THE WAR
NOT IN MY NAME
DON'T ATTACK IRAQ
NO WAR ON IRAQ
NO
Freedom for Palestine
STOP THE WAR

Photo 22.1 Ask these people and they'd report negative attitudes towards the 2003 war in Iraq!

FOCUS POINT 22.1

The importance of attitudes

According to Allport (1935: 798), 'The concept of attitudes is probably the most distinctive and indispensable concept in contemporary American social psychology. No other term appears more frequently in the experimental and theoretical literature.'

ACTIVITY BOX 22.1

The war in Iraq

You will probably remember that in 2003 the UK, the USA and some other countries went to war with Iraq. Were you pro- or anti-war? Write down as many attitudes of yours that you can towards the war in Iraq, then think about the following questions.

1. What do you think caused you to hold the attitudes you have towards the war?
2. Do you think you would hold different attitudes if the coalition had had the backing of the United Nations?
3. Have your attitudes changed in the aftermath of the war?
4. What role did the media play in your attitudes towards the war?
5. Did you ever find yourself doubting your attitudes after discussing the war with other people? If so, why do you think this was?

2. How do we develop the attitudes we hold about particular issues, events or people?
3. How do we measure attitudes?
4. How do attitudes relate to behaviour? Is how people behave towards an 'attitude object' dependent on their thoughts and feelings towards that object?
5. Are an individual's attitudes stable over time or do they change? Which factors are important in describing how and why attitudes may alter?
6. How can we persuade people to change their attitudes?

These questions have been of enduring interest to social psychologists over the past 80 years (Eagly and Chaiken, 1998; Stainton Rogers et al., 1995). However, the first thing we need to do is to define what we mean by 'attitude' (see Focus point 22.2).

Defining attitude

An attitude is a hypothetical construct. As a hypothetical construct an attitude cannot be directly observed, it can only be inferred from other responses that *can* be observed (such as what a person says about what they think and how they feel towards an attitude object). Attitude objects (those things we have attitudes about) may be concrete (e.g. Brussels sprouts), abstract (e.g. Marxism), people (e.g. President George W. Bush), groups of people (e.g. immigrants) and even inanimate objects (e.g. telephones). Our behaviour towards another person is assumed to be the result of the attitude we hold about that object. These general comments show that numerous definitions have been offered for the term 'attitude' (see also Focus point 22.2).

FOCUS POINT 22.2

Some definitions of attitude

'. . . a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour. . . . Evaluating refers to all classes of responding, whether overt or covert, cognitive, affective or behavioural' (Eagly and Chaiken, 1993: 1).

'. . . a summary evaluation of an object of thought. An attitude object can be anything a person discriminates or holds in mind. Attitude objects may be concrete (e.g. pizza) or abstract (e.g. freedom of speech), may be inanimate things (e.g. sports cars), persons (e.g. Slobodan Milosevic, oneself) or groups (e.g. conservative politicians, foreigners)' (Bohner and Wänke, 2002: 5).

'. . . a mental and neural state of readiness, organised through experience, exerting a distinctive or dynamic influence upon the individual's response to all objects and situations with which it is related' (Allport, 1935: 810).

'. . . an evaluative disposition toward some object. It's an evaluation of something or someone along a continuum of like-to-dislike or favourable-to-disfavourable' (Zimbardo and Lieppe, 1991).

When we think about a social object or some other social stimulus we evaluate it by asking ourselves how positive or negative it is. Do we like or dislike the object? For some psychologists this liking or disliking, or the feelings we have about an object, forms the basis of what attitudes are about (Petty and Cacioppo, 1996).

Self-test: What is an attitude?

Functions of attitudes

Why have attitudes? What purpose do they serve for us? Shavitt (1989) proposes four different functions for attitudes:

1. maintenance of self-esteem
2. a utilitarian function
3. a knowledge function
4. a social identity function.

We will now look at each of these in turn.

Maintaining self-esteem

This assumes that negative attitudes operate to distance us from others or groups of others that may pose a threat, like minorities or out-groups (see Chapter 25). For example, being a member of the far-right political wing will not be beneficial for your own self-esteem if you define yourself as the typical student who traditionally holds opposing political views. As such you'll likely have a negative attitude towards these groups.

At the same time, positive attitudes serve the function of aligning us with favoured groups. For example, back in 1930s' Germany you would probably have had a more favourable attitude towards the far right and Nazism in particular. In psychoanalytic terms, these factors can be seen as acting in an ego-defensive way (Katz, 1960).

Utilitarian function

This approach is based on operant learning processes (see Chapter 8). It means that attitudes are used to gain positive outcomes and, at the same time, avoid negative outcomes. In essence, we favour or disfavour attitude objects because they become associated with punishments and rewards and we learn to adapt our behaviour to maximise reward and minimise punishment. We might, for instance, come to learn that aligning ourselves with the views of a 'popular' group (e.g. the 'in-crowd') will result in us getting social approval from other group members. Also behaving in ways consistent with those views and in ways consistent with other members of the group will again result in positive reinforcement.

Knowledge function

All attitudes serve a knowledge function inasmuch as they help us to organise our social worlds. They provide a means of interacting with and making sense of events in our environment (Smith et al., 1956). Social cognitive accounts see attitudes as types of schema that guide the information processing of socially relevant experiences (Eagly and Chaiken, 1993; Fiske and Taylor, 1991). This 'guiding' role makes it easier for us to respond to objects in consistent ways. Attitudes allow us to think about how to respond to objects in our environment without too much effort.

Social identity function

Basically, attitudes enable us to express our individual core values. Katz (1960) called this the value-expressive function. Expressing our attitudes also allows us to establish an identification with other groups (Smith et al., 1956). For instance, wearing a replica Chelsea football shirt acts as a marker of identification with other Chelsea fans.

Having looked at what functions attitudes serve for us in our social world we now turn to the issue of how attitudes are structured in our minds.

Self-test: What are the four functions of attitudes?

Structure of attitudes

Over the years psychologists have argued about the structure of attitudes. As we have seen, some believed that an attitude equals a general evaluation of an object (Edwards, 1957; Petty and Cacioppo, 1981). This evaluation represents an emotional judgement – how an individual feels towards an object – and has been called the unidimensional approach (Thurston, 1930; Petty and Cacioppo, 1981). But is that all there is to an attitude as an evaluative tool? Are attitude objects evaluated only on the basis of how they make us feel? Proponents of the multidimensional approach think not (Eagly and Chaiken, 1993; Rosenberg and Hovland, 1960).

As shown in Figure 22.1, psychologists have argued that there are three types of response that are used when we evaluate another person's behaviour or other attitude object. These evaluation types can be summarised by the acronym ABC: affective, behavioural and cognitive components. The

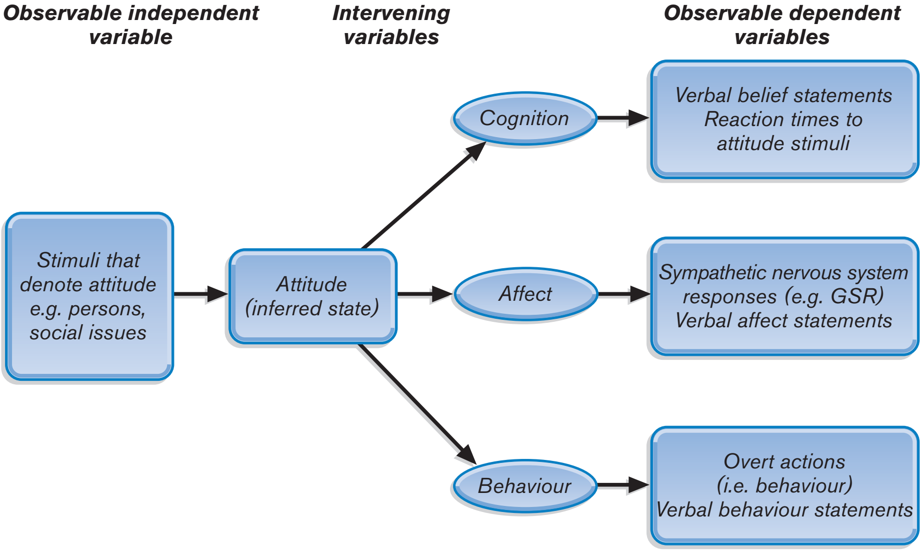

Observable independent variable
Intervening variables
Observable dependent variables
Stimuli that denote attitude e.g. persons, social issues
Attitude (inferred state)
Cognition
Affect
Behaviour
Verbal belief statements Reaction times to attitude stimuli
Sympathetic nervous system responses (e.g. GSR) Verbal affect statements
Overt actions (i.e. behaviour) Verbal behaviour statements

Figure 22.1 The three-component view of attitude structure
Source: developed from Eagly and Chaiken, 1993: 10

cognitive component refers to the thoughts people have about the attitude object. The affective component (or emotional component) refers to the feelings or emotions that we have about the attitude object. Finally, there's the behavioural, or *conative*, component.

This last component has consistently been confused as meaning that instead of predicting actual behaviour, behaviour itself is part of the attitude. This is not the case. The behavioural component does not refer to actual behaviour but *intentions* to behave. In other words, our attitudes are made up of our thoughts, feelings and behavioural intentions towards the attitude object.

The important point about the multidimensional approach is that there is no inconsistency between the cognitive, affective and behavioural responses to an attitude object. In other words, the way we feel about an object is usually consistent with our beliefs about that object. The three components of this model are thought of as being of equal importance for the definition and expression of an attitude. An individual expresses an attitude when he or she has thought about the object, has then interpreted how they feel about it and, finally, understood the different ways of responding to it.

As an example, take a positive attitude towards New Labour. According to the multidimensional approach this positive attitude will comprise thoughts and expectations that, for example, university students will not have to pay for their education (a positive belief or cognition), a liking or respect for New Labour representatives (a positive feeling or affect) and the intention to join the Labour Party (positive behavioural intention).

Since attitudes are the process through which we evaluate social objects, it seems reasonable that attitudes need to be represented in a person's memory. So when an attitude object is encountered, the memory for the response to that attitude has to be retrieved. This retrieval can be either deliberate and controlled or spontaneous and uncontrolled (i.e. automatic).

For instance, when asked to make a judgement about an attitude object (in other words, consciously deliberate) a person will construct their response from what they have stored in memory about that object (Schwarz and Bohner, 2003). Alternatively, the mere presence of the attitude object itself without any conscious awareness of the judgement process is enough to elicit an evaluative response from memory. These have been called implicit attitudes (Greenwald and Banaji, 1995).

Attitude development

Up to this point, we have seen how attitudes have been defined by psychologists, what functions attitudes serve for us and how attitudes are structured and organised in our minds. We now turn to how attitudes develop.

Although some have argued that attitudes are derived from a genetic or biological basis (see Waller et al., 1990), most social psychologists think, or believe, that attitudes develop as a result of experience – they are learnt in some way.

Allport (1935) believed that attitudes are learnt by the same principles as other learnt responses. The result of this learning experience is that a new or redefined attitude is stored in memory for future use when the same attitude object is encountered (Eagly and Chaiken, 1993).

Attitude development through mere exposure

The first way in which attitudes are thought to develop is through mere exposure. Zajonc's (1968) mere exposure effect argues that people develop more positive feelings about other objects or people the more they are exposed to us – the more we see something, the more we seem to like it. In his classic study, participants were shown a number of Chinese characters and told that they were taking part in an experiment to see how people learn a foreign language. Some of these characters were shown just once, some 10 times, some 25 times and so on. In other words, participants were exposed more frequently to some characters. After they had seen the characters, the participants were told that each of the characters was actually a positive or negative adjective. They were then asked to rate how favourable they thought each of the characters was. What did Zajonc find? Well, in line with the mere exposure effect, he showed a positive linear relationship between the numbers of times a character had been presented and how favourably that character was rated. The more people were exposed to the character, the more favourable they thought it to be. Importantly, Zajonc argued that mere exposure occurs even if we have not actually had any interaction with the attitude object. We may not even be aware ourselves that an attitude has been developed in us.

Attitude development through associative learning

A second way that has been presented to explain how attitudes develop is known as associative learning or learning by observing how people, objects and so on interact or associate in our everyday environment. Two approaches to associative learning are operant conditioning and classical conditioning. These approaches have been massively influential in the study of learning processes in general and the formation of attitudes is no exception. (Turn to Chapter 8 for a description of the principles involved in operant and classical conditioning.)

One early but influential study using operant conditioning principles was conducted by Hildum and Brown (1956). In this study, participants were asked questions about their university education policies. Some participants were reinforced when their answers were favourable about the policies and others were reinforced when their answers were unfavourable. Also, for half the participants, the verbal reinforcement was the word 'good' and for the other half it was 'mm-hmmm'. The study showed that 'good' was more successful in getting the required conditioning response from the individual (i.e. either favourable or unfavourable attitudes).

Insko (1965) replicated these results but found, in addition, that participants who were conditioned to express positive attitudes also showed greater favourability a week later. The same was true for those conditioned to show more negative opinions.

Other psychologists have described how classical conditioning operates in the development of attitudes. The most influential of these is Arthur Staats (see Staats, 1983, for an overview of his ideas). He argued that people learn attitudes in much the same way as Pavlov's dogs learned to salivate on the presentation of a light or sound.

He showed that with the experience of emotional responses (feelings of uneasiness or pleasure) a person learns the evaluative message of words like 'good' and 'bad' because these words (the conditioned stimuli) are paired with unconditioned stimuli, such as physical punishment or the desire to be respected by others. These established attitudes are then available as unconditioned stimuli and, when paired with other conditioned stimuli, will produce a new conditioned response.

These ideas can be used to understand how people come to hold prejudiced attitudes towards minority groups. For instance, imagine that, while growing up, a child repeatedly hears words like 'bad', 'stupid', 'untrustworthy' paired with the name of minority groups (e.g. illegal immigrants, Jews). Over time it is likely that this repeated pairing will result in a conditioned response – in this case a negative attitude towards minority groups. If attitudes guide behaviour, it may be that some people will then act on their learning experience. (See Chapter 25 for a discussion of prejudice.)

Attitude development through self-perception

Self-perception theory (Bem, 1965) refers to the idea that we form our attitudes by observing our own behaviour (see section on attitude change in this chapter) and not by being exposed to environmental stimuli or through associative of stimuli. Basically, the argument goes that our attitudes develop by looking at ourselves in terms of the feelings, beliefs or actual behaviours we express about objects in our environment and then by attributing these beliefs to causes that can either be internal to the person doing the observing (indicative of our own attitude) or external causes. In one study, Chaiken and Baldwin (1981) showed that people who were forced to report and emphasise pro-environmental behaviours they undertook were more likely to report attitudes about themselves that were pro-environmentally based and those asked to emphasise anti-environmental behaviours were more likely to report anti-environmental attitudes subsequently. In other words, these people had 'seen' their attitude through their behaviour and could infer it in this way. The important point here is that this worked only in people who had initially reported a weak pro- or anti-environmental attitude. So, attitude development through self-observation seems to work when people do not already hold an attitude about a part of their environment.

Self-test: How are attitudes learnt?

Measuring attitudes

Attitudes cannot be observed directly. Because of this, psychologists have had to find ways of measuring them, either directly or indirectly. Direct measures usually involve asking a person about their attitudes and beliefs towards another social object or issue, whereas indirect measures use other cues to *infer* the attitude the person holds. Some indirect measures have been designed to measure the attitudes that people are even unaware that they hold – these are called *implicit* attitudes.

RESEARCH METHODS BOX 22.1

Examples of semantic differential and Likert scales

Likert scale

Items assessing primary healthcare workers' attitudes towards working with drug users (from Albery et al., 2003). Each statement is presented with a scale ranging from 1 to 7: 1 represents total disagreement and 7 total agreement. Higher scores indicate a more favourable attitude towards working with drug users. Because of this the item marked with an asterisk (*) is reverse-scored before analysis.

- I often feel uncomfortable when working with problem drug users.*
- One can get satisfaction from working with problem drug users.
- It is rewarding to work with problem drug users.
- I feel I can understand problem drug users.
- I like problem drug users.

Semantic differential

Applied to attitudes towards using cannabis in the next three months (from Conner and McMillan, 1999).

Using cannabis in the next three months would be . . .

Bad	−3	−2	−1	0	+1	+2	+3	Good
Pleasant	+3	+2	+1	0	−1	−2	−3	Unpleasant

Higher scores indicate a more positive attitude towards using cannabis in the next three months.

Direct measurement

The most common form of direct measurement is to question a person about their attitudes towards an object and ask them to mark their response on a numeric response scale. The most frequently used of these are the *Likert scale* (Likert, 1932) and the semantic differential scale (Osgood et al., 1957). These will be the focus of this section (other less frequently used techniques are the Thurstone scale and the Guttman scale).

The scales are all known as multi-item scales because they use more than one statement to tap the overall attitude towards an object (see Bohner and Wänke, 2002, and Oppenheim, 1992, for reviews of these scales). Research methods box 22.1 gives examples of semantic differential and Likert-type scales.

In the Likert method, people rate how far they agree or disagree with a number of statements. These statements are designed to measure aspects of the overall attitude towards an object or issue. The statements are usually derived from extensive pilot work that includes many more statements than those actually used. The statements selected are those for which agreement unambiguously corresponds to either a positive or negative attitude. The ratings are on five- or seven-point scales, and are summed to get the overall attitude score.

CLASS ACTIVITY BOX 22.1

Measuring attitudes

You are probably all aware that in the summer of 2007 legislation was introduced in England and Wales that made it an offence for people to smoke cigarettes in public places such as pubs, clubs, railway stations, etc. Imagine that you are a researcher who is interested in studying the attitudes towards the smoking ban. In groups, discuss how you would go about designing a study to examine differences between smokers and non-smokers in their attitudes towards the smoking ban. Answering the following questions might help you:

1. How are you going to measure attitudes? Are you going to use the types of scale described in Research methods box 22.1 or do you want to allow people to say exactly what they think by using a more qualitative approach like that shown in Applications box 21.2?
2. How do you go about identifying the core attitudes people hold? Do you interview a sample first and then develop an attitude questionnaire based on these responses?
3. Are there any ways you can get over the threat that people may be just telling you what they think you want to hear? Are there any approaches that may be able to get over this problem?

Designing attitude questionnaires is not as straightforward as it seems. Oppenheim's (2000) book *Questionnaire Design, Interviewing and Attitude Measurement* is an excellent step-by-step guide to the design of attitude measurements.

answers at the end of the section

Semantic differential scales are made up of what are known as bipolar adjective scales. They are bipolar in the sense that one end of the scale is marked with one adjective, such as 'good', while the other end is marked with the opposite of 'good' (i.e. 'bad'). These scales are usually divided into seven response categories and are scored −3 to +3, with positive numbers for the positive adjective (e.g. 'good') and negative numbers for the negative adjective (e.g. 'bad'). The ratings are summed across all differentials to arrive at the overall attitude score for each person.

The main criticism levelled at direct measure techniques is that because people know that their attitudes are being measured they may respond in ways that are not consistent with their 'real' attitudes (a validity issue). This is known as 'impression management'.

The 'bogus pipeline technique' (Jones and Sigall, 1971) was designed to counteract this. Basically, a participant is rigged to what they are told is a psychophysiological indicator of a person's true attitudes. A few practice trials are then given. In these, the participant knowingly gives some false answers to questions that the experimenter knows are actually correct. This demonstrates how powerful the bogus pipeline apparatus is – it has the effect of removing the participant's motivation to distort responses.

Self-test: Give two examples of direct attitude measurement techniques.

Another way to minimise the risk of impression management is by using indirect measures of attitudes (see Class activity box 22.1).

Indirect measurement

Numerous methods have been introduced to measure attitudes indirectly, including projective techniques and physiological measures, such as galvanic skin response (GSR). The chances of getting 'real' attitudes are thought to be increased if the participant is not aware that their attitudes are being studied. (Note that, with physiological measures, although a person may know their attitudes are being measured they do not have control over their physiological responses.)

One interesting example of an indirect measure is the lost-letter technique (Milgram et al., 1965). This involved leaving addressed letters in public places as if they had been lost and then recording how many were returned or posted on and also the condition of the letter. The attitude object was given by the address printed on the letter. Examples from Milgram's studies included the Friends of the Nazi Party, the Friends of the Communist Party and Medical Research Associates. The assumption was that people with positive attitudes towards the object would post the letter back unopened. (A more up-to-date version of this procedure is the lost email technique (Stern and Faber, 1997).)

Other indirect techniques developed out of the need to produce techniques that could measure unconscious cognitive processes – those thoughts that are automatic or spontaneous (Bargh, 1997). The possibility of implicit attitudes, or evaluations, which are out of our conscious control has led to the development of priming techniques (Fazio et al., 1986; Greenwald and Banaji, 1995). In a priming paradigm an uncontroversial target word (e.g. 'untrustworthy') is presented immediately after the participant has been exposed to the attitude object (e.g. 'estate agents'). By pressing response keys, participants are asked to respond as quickly as they can to the target word in terms of how 'good' or 'bad' it is. If evaluations of the prime and the target word are the same (e.g. for those people who have a negative attitude towards estate agents), responses to the target should be quicker than if evaluations are incongruent. The idea is that the prime serves to activate the evaluative response in memory and make it more accessible when other consistent stimuli are encountered.

Another indirect measure is the implicit association test (Greenwald et al., 1998). This measures people's implicit attitudes – or those attitudes that are not available to conscious reflection – by measuring the strength of association between a category, concept or person (like Gordon Brown) and an evaluation (like 'good' or 'bad') (see Research methods box 22.2). (See Bohner and Wänke, 2002: 41–45, for a detailed description of the test.)

Self-test: What are indirect attitude measurement techniques?

The attitude–behaviour relationship

We've already seen that the attitude a person holds about an object is supposed to predict how they behave towards it. Is this true? Some psychologists have reported low attitude–behaviour correspondence or correlation (e.g. Sutton, 1998; Wicker, 1969). Wicker (1969), for instance, reported correlations that ranged between .00 and .30.

LaPiere's (1934) study was one of the first to question attitude–behaviour consistency. In the company of two Chinese people, LaPiere travelled around the USA staying in various hotels and motels. Their expectation was that they would encounter attitudes of an anti-Chinese nature and that they would not find it easy to get accommodation. This was not the case and very few hotel managers refused them accommodation. However, when these same hotels were sent a letter asking whether they would accept Chinese guests, over 90% replied 'no'. There is a clear inconsistency here between attitudes and actual behaviour.

Although this seems to confirm the adage that 'the only completely consistent persons are dead' (Aldous Huxley, novelist, 1894–1963), some psychologists have argued that evidence such as LaPiere's does not give a true reflection of the attitude–behaviour relationship. In searching for determinants of the attitude–behaviour relationship, Fishbein and Ajzen (1975) and Ajzen (1988) proposed their correspondence hypothesis principles of compatibility). They argued that attitudes *do* predict behaviour – provided that specific behaviours are predicted from specific attitudes. In addition, because all behaviour is made up of specific actions, in specific context, for specific time periods and in response to a specific target, attitudinal measures have to reflect this specificity in order to predict relevant behaviours.

A study by Davidson and Jaccard (1979) highlights the importance of correspondence or compatibility. They looked at correlations between married women's attitudes towards birth control and the use of oral contraceptives over a 2-year period. When 'attitude towards birth control' was used as the attitude measure, a low correlation was shown (r 5 .08). When 'attitude towards oral contraceptives' (r 5 .32), 'attitude towards using oral contraceptives' (r 5 .53) and 'attitude towards using oral contraceptives during the next 2 years' (r 5 .57) were used as attitude measures, the correlation increased steadily.

In this case, it is clear that when action, object and time correspond, the attitude–behaviour relationship is more consistent. Context was not included in this study although, hypothetically, the inclusion of context would increase the relationship still further.

Self-test: Define the correspondence hypothesis.

Other factors which have also been shown to be important determinants of the attitude–behaviour relationship are self-awareness and the accessibility and strength of the attitude. When people are aware of their own feelings, thoughts and traits they are said to hold a degree of *self-awareness*. An individual is said to be either privately self-aware or publicly self-aware. Those who are privately self-aware are more likely to behave in accordance with their attitude whereas those who are publicly self-aware behave according to the attitude they think other people hold – they act in line with their perceived social norms (Echabe and Garate, 1994). It is also the case that whether or not there is correspondence between attitudes and behaviour is dependent on how *accessible* your attitudes are. You are more likely to behave in line with an attitude if that attitude is more accessible. For example, Fazio and Williams (1986) showed that attitudes towards American presidential candidates that were highly accessible (measured as faster reaction times to answering questions related to the attitude) predicted the impressions people subsequently formed of these candidates in televised electoral debates and also how people actually went on to vote. Finally, how strongly an attitude is held by an individual will predict whether or not that person will behave in line with their attitude. Attitude strength depends on how much information a person holds about an attitude object and how personally involved they are with the attitude object (Leiberman and Chaiken, 1996).

RESEARCH METHODS BOX 22.2

Exploring implicit attitude associations in memory: The Implicit Association Test

The Implicit Association Test, or IAT, was originally developed by Greenwald, McGhee and Schwartz (1998) to study how far people have an automatic or implicit preference for members of the groups to which they belong (e.g. race, religion, voting preference, etc.) over other groups. In other words, it was designed to explore implicit preferences in attitudes for the in-group over the out-group. The IAT measures differences in reaction times when responding to a number of images and words presented on the computer screen. Each participant goes through a number of stages in which they are asked to respond accurately and quickly to the stimuli by pressing buttons on the computer keypad. Let's go through each of these stages and build an IAT for age, or more specifically, old versus young. In effect we are asking the question: Is there an implicit preference for older versus younger people?

Stage 1: Photographs of people are presented to participants one at a time in the middle of the computer screen. Their task is to categorise each of these photos as either old or young by pressing a key on the left of the keypad for *old* and a key on the right of the keypad for *young*.
Stage 2: Positive and negative words (e.g. angry, happy, etc.) are presented one at a time in the middle of the computer screen. Participants are asked to respond to each word by pressing a key on the left side of the keypad for *positive* and a key on the right of the keypad for *negative*.
Stage 3: Both positive and negative words and old and young photos are presented one at a time randomly. Participants are asked to respond by pressing a key on the left of the keypad if the stimulus is either *old* or *positive*, and one on the right on the keypad if the stimulus is either *young* or *negative*. In effect the keys on the keypads for this stage have two meanings (i.e. old and positive; young and negative).
Stage 4: This repeats Stage 2 except this time responses to positive stimuli are made by pressing a key on the right of the keyboard and responses to negative stimuli by pressing a key on the left of the keypad. All that has changed is the positioning of the response key for positive and negative stimuli.
Stage 5: This repeats Stage 3. This time, however, the left key is used to respond to *negative* or *old* stimuli and the right key to *positive* or *young*.

From these responses we get reaction times and from these reaction times we can calculate what is called an IAT score. The IAT score is calculated by comparing mean response times from Stage 3 with those from Stage 5. If participants are faster to respond at Stage 3 than Stage 5 they are said to have a pro-old implicit preference. In other words, they find it easier to respond quickly when *old* is paired with *positive* and *young* with *negative*. If they respond faster to Stage 5 than Stage 3 they are said to have a pro-young implicit preference. They find it easier to respond when *young* is paired with *positive* and *old* is paired with *negative.*

The IAT has been used to explore implicit associations in race, gender, age, nationality, voting preferences and has even been applied to look at how smokers, cannabis user and drinkers have an implicit preference for smoking-, cannabis- and alcohol-related items (see Houben *et al*., 2006). You can even go online and do a few IATs yourself at https://implicit.harvard.edu/implicit/.

The theory of planned behaviour

Many studies have looked at the so-called attitude–behaviour relationship. One approach was Ajzen's (1991) theory of planned behaviour (TPB). He was interested in studying how the beliefs held by an individual are important for understanding how they decide to behave towards an attitude object and also how their beliefs predict how they subsequently behave. Ajzen's TPB model was derived from the earlier theory of reasoned action (TRA) (Fishbein and Ajzen, 1975) and differs only in that the TPB was aimed at understanding types of behaviour that are not necessarily under a person's volitional control.

Figure 22.2 shows the structure of the TPB. Basically, Ajzen proposed that beliefs are structured according to an expectancy-value framework. In other words, people hold expectancies about what *outcomes* they should get if they behave in a particular way. At the same time, they hold beliefs about the *value* of that outcome for themselves. So consider, for example, submitting your first essay on time; you may think that submitting your essay on time will result in the outcome of getting feedback before you sit your exam (outcome expectancy) and that getting feedback before your exam is a good thing (value association).

So, looking at Figure 22.2, we see that the immediate antecedent of actual behaviour is behavioural intention. If we intend to submit our first essay on time it is likely that we will. This intention to behave is determined by three belief-based factors: attitude, subjective norm and perceived behavioural control. Attitude is made up of core beliefs about the outcomes of a behaviour and the value we hold about these outcomes (we saw an example of this earlier). Subjective norms are those beliefs we have about how other important people want us to behave (normative beliefs) and the value we hold about behaving that way in line with others' wishes (motivation to comply).

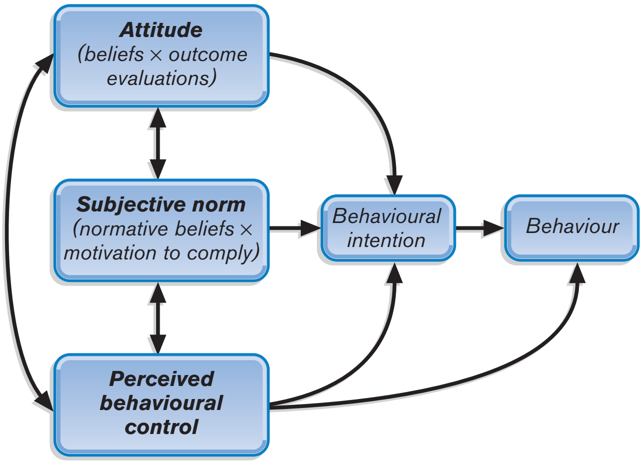
Think back to the example of submitting your first essay on time. It may be that one of the people you believe wants you to submit your essay on time is your lecturer – and of course you'd be right! This is a normative belief. Of course, you like to do what your lecturer wants you to do; this then is motivation to comply. In this instance, it is likely that you will form the intention to submit the essay on time.

Perceived behavioural control comprises those beliefs that relate to how much control a person thinks they have over a certain behaviour. For instance, you are likely to form an intention to submit your essay on time if you believe that it is under your own control. Ajzen argues that we hold many different types of association about single behaviours. It is the sum of these expectancy-value relations that predicts a person's intention to behave in that way, which subsequently predicts their actual behaviour.

Evidence suggests that the TRA and the TPB accurately predict between 40% and 50% of variance in behavioural intention and between 19% and 38% in actual behaviour (Sutton, 1998). Because of this there has been some speculation as to which other factors may be important as extensions to the TPB for predicting behavioural intention and actual behaviour. These include more affective factors, moral norms and self-identity (see Conner and Armitage, 1998; Sheeran, 2002).

Self-test: Is the theory of planned behaviour an expectancy-value model?

One factor that has been the subject of considerable attention in recent years is habit or past behaviour. It is thought that the effect of past behaviour predicts behaviour directly and that this relationship is not necessarily dependent on subjective norms, attitude or perceived behavioural control (Bentler and Speckart, 1979; Sutton, 1994, 1998; Triandis, 1980).



Attitude
(beliefs × outcome evaluations)
Subjective norm
(normative beliefs × motivation to comply)
Perceived behavioural control
Behavioural intention
Behaviour

Figure 22.2 Ajzen's theory of planned behaviour

Ouellette and Wood (1998) argue that past behaviours affect future behaviour in two ways. The first is that well-learned behaviours may occur repeatedly in the same context (e.g. wearing a seatbelt). For this reason, cognitive control over this behaviour eventually becomes automatic. Behaviours that are not so well learned, or those that occur in more unstable contexts, remain under conscious control.

The TPB is used extensively in health psychology to predict health-related behaviours (such as practising safe sex) and this use of the model is discussed in Chapter 35.

The dual-process model of attitude–behaviour relations

Fazio's (1990) MODE model (MODE stands for motivation and opportunities as determinants) studied the conditions under which attitudes towards an object predict behaviour automatically. Fazio proposes that when motivation and the opportunity to think consciously about a potential behaviour are low, attitudes towards the target will activate behaviour immediately and automatically – as long as these attitudes are accessible and easily retrievable from memory. When people can consciously deliberate about a behaviour and motivation is high, the automatic attitude–behaviour relationship will be overridden. In other words, the more we think about it, the more our behaviour will be characterised by deliberative processing. This is very similar to the dual-process model of persuasion presented later in this chapter.

Attitude change

We now turn to how and why attitudes change. Why do you think it is important for a person to change their attitudes? If we assume that attitudes are a predictor of behaviour, then there are ramifications for understanding behavioural change from altering attitudes. This is especially important nowadays in an applied context. For instance, because of the focus on understanding behaviours that are thought of as unhealthy, applied psychologists have undertaken to change behaviour by changing a person's attitude and beliefs towards that behaviour. Some examples of this are driving dangerously (e.g. Parker et al., 1996) or cyclists not wearing a cycle helmet when riding (Quine et al., 2002).

We are bombarded with education campaigns that try to alter our beliefs and convince us to drive less dangerously, to 'kill our speed, not a child', or to stop smoking. If we can identify which beliefs are important in an individual's decision to drive in a dangerous way, and actually change those beliefs, we should be able to change their behaviour. We will see a specific example of this when we look at persuasion models.

Our starting point for understanding attitude change is to examine those approaches that take as their starting point the idea that humans are motivated to maintain consistency between their different beliefs and attitudes and also consistency between these beliefs and their behaviour. Unsurprisingly, these approaches are labelled consistency theories and have been the subject of much research during the lifetime of contemporary social psychology. A number of consistency approaches have been proposed, including Heider's balance theory (Heider, 1958) and Festinger's *theory of cognitive dissonance* (Festinger, 1957).

Heider's balance theory

Fritz Heider's balance theory was especially interested in how attitudes and beliefs about issues and also attitudes and beliefs about people are related in a perceiver's mind. He argued that these relationships are best described as existing in a series of cognitive triads, some of which can be thought of as comprising a consistency pattern and others an inconsistency pattern. If there is inconsistency among these various beliefs then people will try to restore equilibrium by changing one or more of the belief states.

Think about the following example. Imagine that you are P, a friend of yours called Tony is O and New Labour is X. You really like New Labour and, of course, you also like Tony (given that he is your friend). However, in deciding whether these two beliefs are stable you also have to consider whether you perceive Tony to be pro- or anti-New Labour. So we now have a series of triads comprising you (the perceiver, or P), another person (Tony, or O) and finally a non-person attitude object (New Labour, or X). Heider argued that these elements are linked through positive and negative evaluations or feelings.

Figure 22.3 presents all the possible balanced and unbalanced states. Balanced states are those triads that yield a positive figure after multiplying the signs between the elements in the triad (e.g. triads A to D). If the result of this multiplication is negative, an unbalanced cognitive state is said to exist. So, for instance, if you perceive that Tony dislikes New Labour (a negative O–X relation), while remembering that you like Tony (positive P–O relation) and New Labour (positive P–X), an overall negative triad will result (i.e. negative x positive x positive) (Triad F in Figure 22.3).

Heider argued that this state of imbalance results in psychological discomfort, and therefore you will be motivated to restore a state of *equilibrium* to your cognitions. How do you do this? Well, you could change your attitude towards New Labour and adopt a more negative one. You could change your attitude towards Tony and believe he cannot be such a nice person if he feels negatively about New Labour. Or you could attempt to change Tony's negative beliefs about New Labour such that you perceive him to actually have a positive belief about it too. These would make your liking for New Labour and your liking for Tony consistent.

Balance theory, therefore, describes what happens when the internal cognitions we have about our relationship with other attitude objects are consistent or inconsistent. What happens, though, when the inconsistency lies in a mismatch between our attitudes and our actual behaviour towards that object? We now turn to the theory of cognitive dissonance.

Festinger's theory of cognitive dissonance

Like Heider's approach, the cognitive dissonance theory assumes that people want to avoid feelings of discomfort by maintaining consistency among their cognitions. Leon Festinger (1957) argued that a person's attitudes or beliefs could be consonant (in line with one another), dissonant (at odds with one another) or unrelated to one another. If a person has a set of dissonant beliefs, the result is an unpleasant state of arousal. Because of this unpleasant psychological feeling, the person is motivated to change all or some of their beliefs so that they become consistent again and the unpleasant state is alleviated.

Festinger and Carlsmith (1959) demonstrated this effect in their famous induced compliance experiment. In this experiment participants first had to perform a series of very lengthy, extremely tedious tasks (like turning pegs in peg holes). Afterwards they were asked to tell the next participant (who was in fact a confederate) that the tasks they would do were actually really interesting! In effect, the participants were asked to lie. The idea was to create in each participant the dissonant cognitions that, on the one hand, they had disliked the experiment but, on the other hand, they had told another person that they enjoyed it.

In addition, half of the participants were given $20 for compliance with the 'lying' request and the other half a meagre $1. The idea here was that those in the $1 group would experience a higher level of cognitive dissonance than those in the $20 group because they had insufficient justification for the inconsistency between their attitudes (i.e. 'that really was a boring task') and their actual behaviour (i.e. lying about the behaviour to another person). The $20 group had the justification of a decent money payout and would thus experience less dissonance. It was predicted that the $1 participants, being highly cognitively dissonant, would change their attitude towards enjoying or liking the tasks so as to re-establish consonance; those in the $20 condition would not. This was exactly what happened when attitudes towards the task were measured after the experiment.

Festinger's work clearly demonstrated that justification, choice and investment were three key factors in predicting whether or not dissonance would be encountered in the induced compliance paradigm. When we cannot justify our counter-attitudinal behaviour, freely choose to behave in that way and the attitude itself is one that is important to us in terms of our self-concept, it is likely dissonance will be experienced and attitude change likely. Further studies over the years have added to the original work by showing other conditions under which attitude change may result. These include the need for the person to feel some physiological

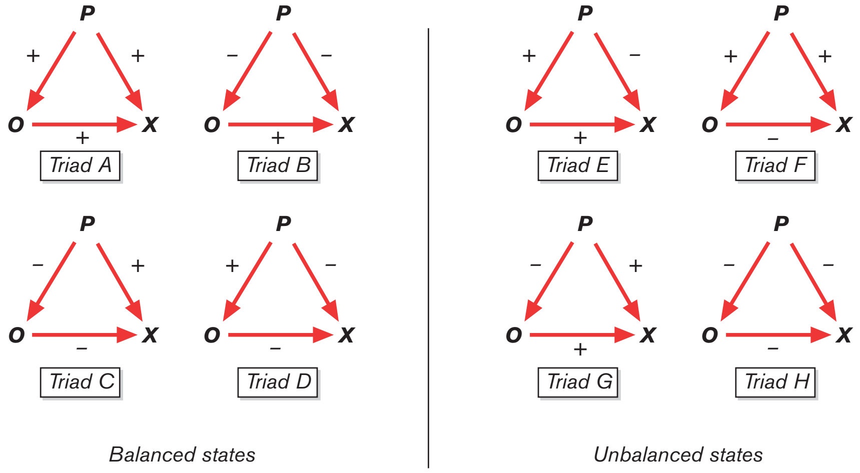


Figure 22.3 Heider's balance theory

arousal as a result of dissonant beliefs (Zanna and Cooper, 1974) and the need for the person to feel personal responsibility for the behaviour (Linder et al., 1967).

Self-test:

- Describe two consistency theories of attitude change.
- What is cognitive dissonance?

Bem's self-perception theory

Although well over a thousand studies have been published on cognitive dissonance, the theory is not without its critics. The main opposition is Bem's (1965, 1972) self-perception theory. Daryl Bem took a more attributional approach. His starting point was not a rejection of the findings of dissonance experiments but to disagree with the interpretation offered for these findings. He claimed that people infer their attitudes by attributing events in the same way as an outside observer would. In other words, people act as observers of their own behaviours and only infer their attitudes from this observation.

In essence, behaviour can have internal (dispositional) and external (situational) causes. According to Kelley (1972), internal causes (like attitudes) are inferred when external attributions cannot be made (see Chapter 23). So when people are forced to act in a way that is counter to their true attitudes (like lying about how interesting a study is), and do not get sufficient justification for doing so (such as being paid), they are more likely to make an internal inference or attribution, such as 'the tasks in the experiment really were interesting'. If sufficient reward is given (like the $20 condition in Festinger and Carlsmith's study), then they are able to make the default external attribution and no internal appraisal is necessary.

Based on this reasoning, Bem argued that the effects seen in induced compliance experiments with reward – like writing a counter-attitudinal essay and being paid for it or the forced compliance paradigm adopted in Festinger and Carlsmith's work – are best explained in terms other than a feeling of psychological discomfort or negative physiological arousal (the main tenet of dissonance theory). He showed that identical inferences to those people doing an induced compliance technique were found for individuals who had only been told about the technique. For Bem, therefore, attitude change occurs when a person has information about the behaviour and the conditions under which it happened, not because of arousal states.

How inconsistent are dissonance theory and self-perception theory? At first glance, you may think they are very different. Some authors have argued that it is very difficult to distinguish conceptually between the two approaches and that both may be relevant under different circumstances or in different contexts (e.g. Eagly and Chaiken, 1993; Eiser and van der Pligt, 1988). Indeed Fazio et al. (1977) provided a synthesis of the two approaches. They argue that dissonance is a better explanation when a person makes an argument that is very distant from their original attitudes (attitude discrepant), whereas self-perception processes are more appropriate when an individual makes arguments proximal, or close, to their initial attitudes (attitude congruent).

Another approach for induced compliance effects comes from impression management theorists (e.g. Tedeschi, 1981). Impression management refers to the processes people use to present a desirable image of themselves to others in social interaction. Impression management assumes that people are motivated to appear to be consistent, in order to avoid feelings of social embarrassment such as anxiety. This motivational assumption is similar to that underpinning dissonance theory.

Where the approaches differ, however, is at the level at which this motive acts. The impression formation approach argues that it operates at a public level in social interaction, whereas dissonance theory assumes a more private level in the cognitions of individuals. In other words, participants are thought of as deceiving the other person in the interaction by faking an attitude that is in line with a discrepant behaviour, even though they have not really changed their attitudes. If attitudes do change, as in Festinger and Carlsmith's $1 group, the motivational basis for the change happens at a more social level than a strictly cognitive level.

Persuasion processes

Having looked at those processes that are important in describing how attitudes change we now turn to models and theories that have been developed to examine the persuasion process. For psychologists, persuasion refers to how attitudes change as a result of exposure to messages and information about the attitude object.

We are exposed daily to persuasive messages that are designed to alter our attitudes towards an object or behaviour (from favour to disfavour or vice versa) with the assumption that changing the attitude in the desired direction will result in a behavioural change in line with the new attitude. We are bombarded with these from the television screen, the radio, billboards, newspapers, magazines and from other people around us; they also come in the form of advertising campaigns and health promotion literature. It seems that we are constantly subjected to persuasion processes during our everyday lives (Petty and Cacioppo, 1996).

So what are these persuasion processes? The primary questions psychologists interested in persuasion ask are 'Which cognitive processes are important for describing how attitudes change after exposure to a persuasive communication?' and 'Based on this knowledge, can we design persuasive communications that are likely to evoke long-lasting attitude change?'.

Early work on persuasion processes at Yale University identified a number of factors that are important for describing the conditions necessary for a persuasive communication to be effective (Hovland and Janis, 1959) (see Figure 22.4). These factors are the message *source* (Who is doing the persuading?), aspects of the *message* itself (e.g. Does scaring people persuade them to change?), the message *recipient* (Who is being persuaded?) and the *context* of the persuasion attempt (Under what conditions is the person being persuaded?).

What this work did not show is which specific cognitive processes are important for manipulating attitudes, and then behaviour, through persuasive communication. For this let's look at models that propose two modes of cognitive processing that differ in the extent to which a person uses more effortful thinking about the information and arguments included in any persuasive message. Two of these dual-process models are the elaboration likelihood model (ELM) (e.g. Petty and Cacioppo, 1996) and the heuristic systematic model (HSM) (Bohner, Moskowitz and Chaiken, 1995; Chen and Chaiken, 1999). These approaches have been the focus of much persuasion work since the late 1970s and were based on earlier work from the so-called cognitive response approach to persuasion (see Greenwald, 1968).

Elaboration likelihood model of persuasion

In the ELM (Petty and Cacioppo, 1986), the modes of thinking that lead to changes in attitudes and behaviour following exposure to a persuasive communication are (i) the central processing route and (ii) the peripheral processing route (see Figure 22.5). These types of processing form the extreme ends of what can be thought of as an 'effort-based cognitive processing continuum'.

At one end of the continuum is the pure central processing route or mode, which is characterised by the message recipient being fully engaged with the content of the message and the information it contains. This means that the perceiver is engaged in effortful cognitive processing. At the other end of the continuum is the peripheral processing route or mode, which is dependent on resources that require very little cognitive effort, such as *heuristics*. These are general rules of thumb used in decision making. An example of a heuristic in the context of persuasion could be 'what experts say is always correct'.

The idea behind the ELM is that to achieve central route processing people need to elaborate on the details of the

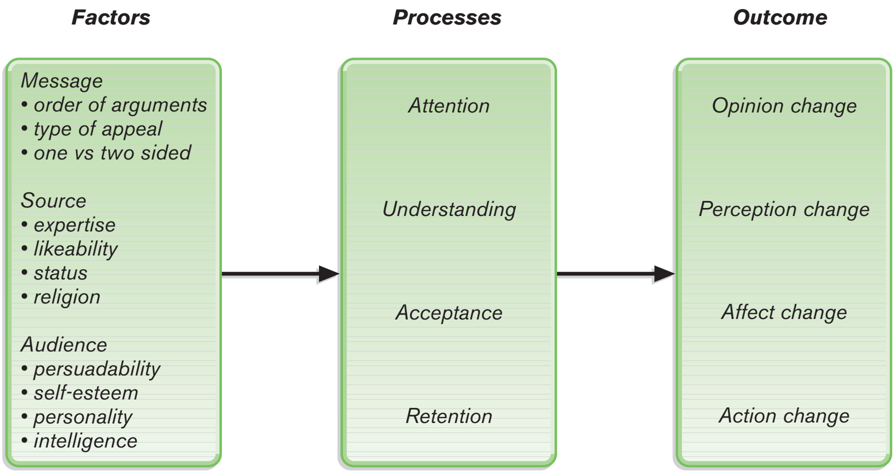


Figure 22.4 The Yale model of persuasive communication
Source: adapted from Fishbein and Ajzen, 1975

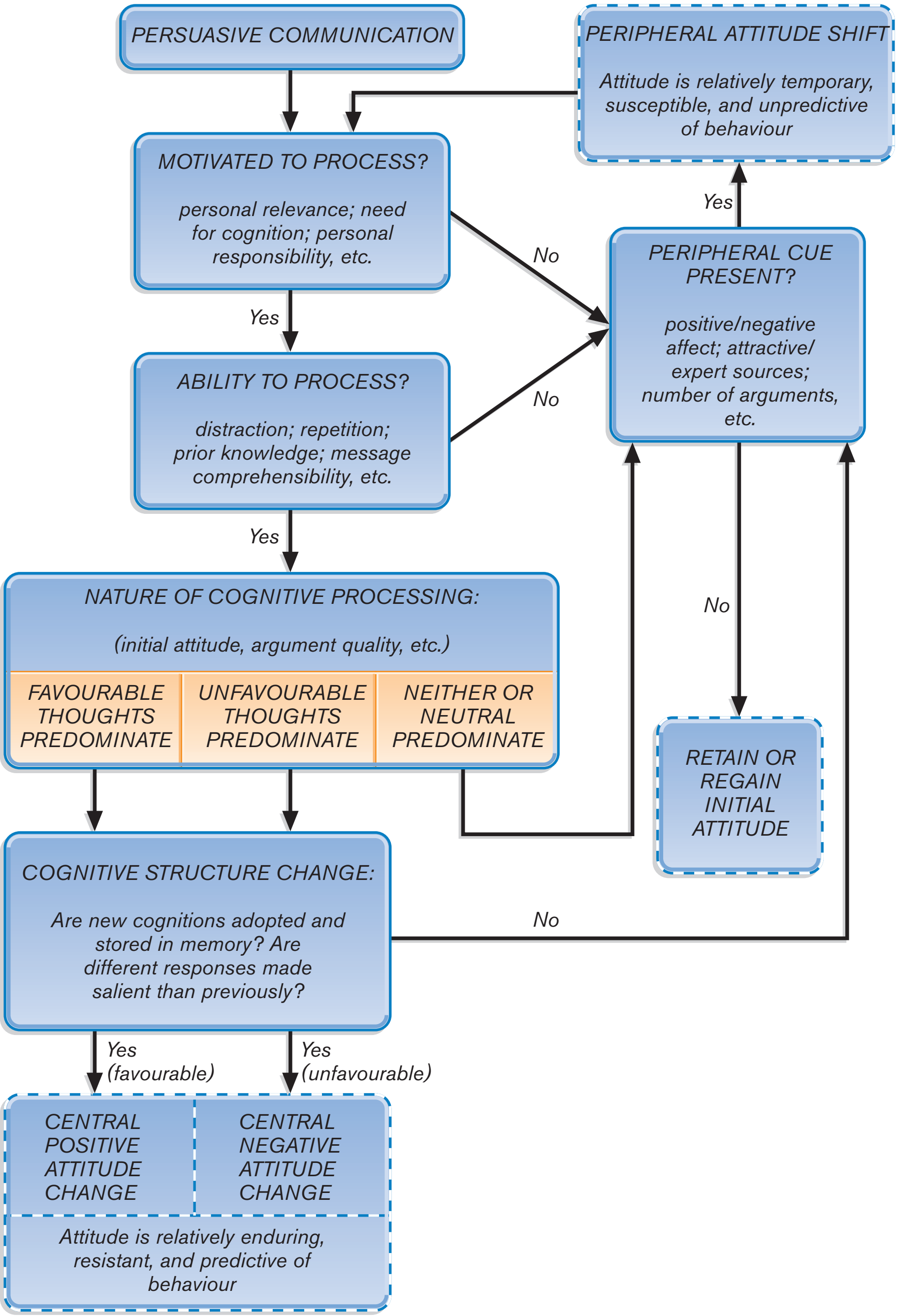

PERSUASIVE COMMUNICATION
PERIPHERAL ATTITUDE SHIFT
Attitude is relatively temporary, susceptible, and unpredictive of behaviour
MOTIVATED TO PROCESS?
personal relevance; need for cognition; personal responsibility, etc.
No
Yes
PERIPHERAL CUE PRESENT?
positive/negative affect; attractive/ expert sources; number of arguments, etc.
Yes
ABILITY TO PROCESS?
distraction; repetition; prior knowledge; message comprehensibility, etc.
No
Yes
NATURE OF COGNITIVE PROCESSING:
(initial attitude, argument quality, etc.)
FAVOURABLE THOUGHTS PREDOMINATE
UNFAVOURABLE THOUGHTS PREDOMINATE
NEITHER OR NEUTRAL PREDOMINATE
No
RETAIN OR REGAIN INITIAL ATTITUDE
COGNITIVE STRUCTURE CHANGE:
Are new cognitions adopted and stored in memory? Are different responses made salient than previously?
No
Yes (favourable)
Yes (unfavourable)
CENTRAL POSITIVE ATTITUDE CHANGE
CENTRAL NEGATIVE ATTITUDE CHANGE
Attitude is relatively enduring, resistant, and predictive of behaviour

Figure 22.5 Petty and Cacioppo's (1986) elaboration likelihood model of persuasion
Source: Eagly and Chaiken, 1993

message, which means that they engage in an *effortful* way. One way of doing this is using the thought-listing technique (Cacioppo et al., 1981). During and after being exposed to a persuasive message, participants are asked to report any thoughts that come to mind. Because people have only limited cognitive processing capacity (see Fiske and Taylor, 1991, on the assumptions of social cognition; see also Chapter 21), people cannot elaborate every persuasive message they come across. As such, peripheral processing is thought of as the default mechanism in the ELM.

What determines whether a person elaborates? The ELM assumes that (i) motivation to process the information (e.g. personal involvement with the message and accountability for a behavioural decision (Petty and Wegener, 1998)) and (ii) the actual ability to process the information (e.g. the presentation of strong versus weak arguments (Petty et al., 1981)) are crucial. If a person is motivated and able to engage with a message, the likelihood is that they will elaborate the message and engage in central processing. Decreased motivation and ability are associated with less cognitive effort and more peripheral processing. Attitudes formed via the central route are more persistent, harder to change and good predictors of behaviour. Those formed via the peripheral route are more transient in nature and less likely to lead to long-term behaviour change. More recently, the ELM has been used in trying to change attitudes and behaviour in applied contexts, including health-related (e.g. Jones, Sinclair and Courneya, 2003) and advertising-related contexts (e.g. Lammers, 2000). Applications box 22.1 gives an example of how the ELM has been used in persuading school children to use cycle helmets when bike riding (Quine et al., 2002).

Heuristic systematic model of persuasion

Like the ELM, the HSM of persuasion is characterised by two modes of processing (Chen and Chaiken, 1999). One of these is an effortless heuristic mode, the other a more demanding systematic mode. Also like the ELM, the HSM assumes a ‘processing continuum’ and that this processing effort is dependent on a person’s motivation and ability to process the persuasive message.

When a person is engaged in systematic processing he or she undertakes comprehensive and analytical appraisal of the message when forming a judgement. This is similar to how the central processing of the ELM works. The heuristic processing mode uses general rules of thumb – like ‘if an expert thinks that, it must be right’ – which are stored in long-term memory for decision making. Little cognitive effort is required to use this latter processing mode.

The activation in memory and use of this mode depend on the presence of a heuristic cue in the message. An example of a heuristic cue could be mere delivery of the message by what is perceived to be an expert source. You can see that heuristic processing is more precise than the peripheral route of the ELM inasmuch as it focuses specifically on heuristics. Like the peripheral route of the ELM, heuristic processing is the default process when presented with persuasive messages. We are not ‘set up’ to be motivated to process all information intensively, which is required for systematic processing in the HSM.

However, unlike the ELM, the HSM makes different predictions of what happens with fluctuations in motivation

APPLICATIONS BOX 22.1

An example of attitude change using the ELM: the case of encouraging cycle helmet wearing among school children (Quine, Rutter and Arnold, 2002)

This study aimed to use the ELM to change the attitudes of school-age children towards wearing cycle helmets when riding their bicycles.

Background

Pedal cycle accidents are one of the leading causes of death and injury among school-aged children. The UK Department for the Environment, Transport and the Regions reported that in 1999 nearly 4000 people aged 8 to 19 were killed or injured as cyclists. This accounted for 37 per cent of all injuries to cyclists (DETR, 2000).

Quine *et al.* used elements of the ELM to change certain beliefs drawn from the theory of planned behaviour that previous work had shown to be important in determining that a child would not wear his or her helmet.

Method

A total of 97 adolescents aged between 11 and 15 years who reported not using cycle helmets were randomly assigned to receive an intervention booklet or a control booklet. The intervention booklet contained persuasive messages in the form of flow charts based on behavioural beliefs (‘protecting one’s head’), normative beliefs (‘the expectations of parents for wearing a cycle helmet’) and control beliefs (‘overcoming the barriers to helmet use’). Participants were asked to respond to and elaborate on the information contained in the message and also to list the thoughts that came to mind while reading the persuasive information.

The control group was given a booklet that was concerned with attending a cycling proficiency course. The independent variable in this study was intervention vs control group, and the dependent variables were cycle helmet wearing behaviour five months after the intervention, and attitudes immediately after the intervention and five months later.

Results

After five months, 25 per cent of the intervention group wore a helmet when riding. None of the control group did so. Results also showed changes in behavioural, normative and control beliefs for the intervention group and not in the control group. Intervention participants showed more positive beliefs about wearing cycle helmets when riding.

Conclusion

School-aged children can be persuaded to change their attitudes and subsequent behaviour in regard to wearing helmets. The TPB and methods within the ELM are useful tools for designing effective interventions.

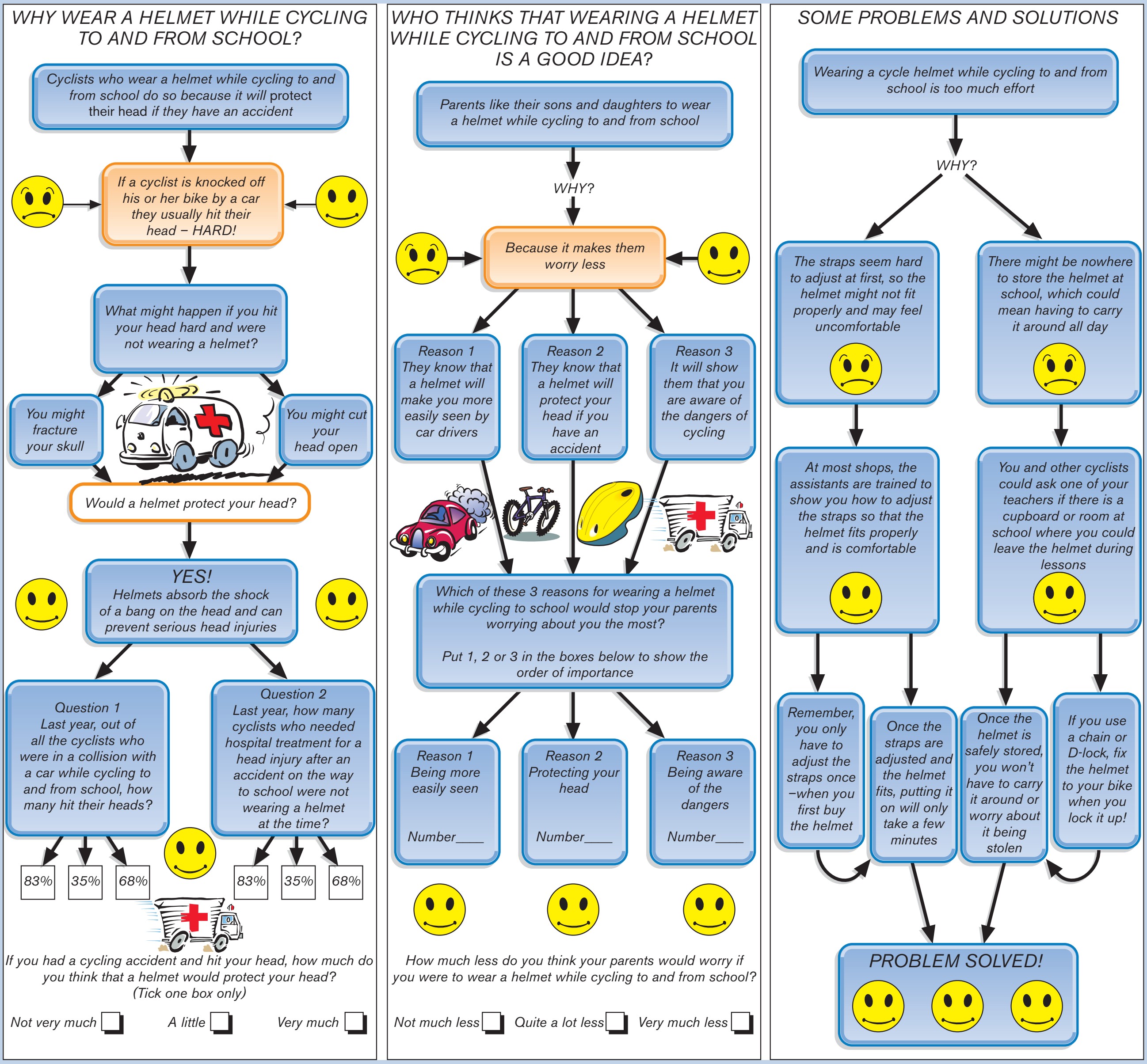

WHY WEAR A HELMET WHILE CYCLING TO AND FROM SCHOOL?
Cyclists who wear a helmet while cycling to and from school do so because it will protect their head if they have an accident
If a cyclist is knocked off his or her bike by a car they usually hit their head – HARD!
What might happen if you hit your head hard and were not wearing a helmet?
You might fracture your skull
You might cut your head open
Would a helmet protect your head?
YES!
Helmets absorb the shock of a bang on the head and can prevent serious head injuries
Question 1
Last year, out of all the cyclists who were in a collision with a car while cycling to and from school, how many hit their heads?
Question 2
Last year, how many cyclists who needed hospital treatment for a head injury after an accident on the way to school were not wearing a helmet at the time?
83%
35%
68%
83%
35%
68%
If you had a cycling accident and hit your head, how much do you think that a helmet would protect your head?
(Tick one box only)
Not very much ☐
A little ☐
Very much ☐
WHO THINKS THAT WEARING A HELMET WHILE CYCLING TO AND FROM SCHOOL IS A GOOD IDEA?
Parents like their sons and daughters to wear a helmet while cycling to and from school
WHY?
Because it makes them worry less
Reason 1
They know that a helmet will make you more easily seen by car drivers
Reason 2
They know that a helmet will protect your head if you have an accident
Reason 3
It will show them that you are aware of the dangers of cycling
Which of these 3 reasons for wearing a helmet while cycling to school would stop your parents worrying about you the most?
Put 1, 2 or 3 in the boxes below to show the order of importance
Reason 1
Being more easily seen
Number____
Reason 2
Protecting your head
Number____
Reason 3
Being aware of the dangers
Number____
How much less do you think your parents would worry if you were to wear a helmet while cycling to and from school?
Not much less ☐
Quite a lot less ☐
Very much less ☐
SOME PROBLEMS AND SOLUTIONS
Wearing a cycle helmet while cycling to and from school is too much effort
WHY?
The straps seem hard to adjust at first, so the helmet might not fit properly and may feel uncomfortable
There might be nowhere to store the helmet at school, which could mean having to carry it around all day
At most shops, the assistants are trained to show you how to adjust the straps so that the helmet fits properly and is comfortable
You and other cyclists could ask one of your teachers if there is a cupboard or room at school where you could leave the helmet during lessons
Remember, you only have to adjust the straps once –when you first buy the helmet
Once the straps are adjusted and the helmet fits, putting it on will only take a few minutes
Once the helmet is safely stored, you won't have to carry it around or worry about it being stolen
If you use a chain or D-lock, fix the helmet to your bike when you lock it up!
PROBLEM SOLVED!

Figure 22.6 The persuasive communication used in the Quine et al. (2002) study

and cognitive activity. It is argued that, even at higher levels of motivation and activity, although systematic processing is strong, people may still be using heuristic processes. This interaction between processing types has been labelled the co-occurrence hypothesis (Bohner *et al.*, 1995). For instance, if a message contains both strong and weak points (i.e. it is ambiguous), the initial heuristic processing of the information will bias subsequent systematic processing. Attitudes will therefore follow that are to some extent consistent with the original heuristic applied (Chaiken and Maheswaran, 1994). This highlights how intrinsically related both processing modes are in the HSM.

The HSM also proposes which factors are important for levels of motivation to use either processing type. One important factor is called the *sufficiency principle*. This is the assumption that people want to have confidence in their attitudes, but whether or not this confidence is sufficient is dependent on the sufficiency threshold (or desired confidence) and actual confidence. When actual confidence is lower than desired confidence a person will be more motivated to process information at the systematic level.

The bigger the difference between these types of confidence, the greater will be the processing needed to reduce the gap.

Self-test: Outline one dual-route approach to persuasion.

Other factors – such as accountability and how relevant the message is to the individual – have also been found to be important for desired confidence or sufficiency threshold levels. To illustrate if an issue raised in the persuasive communication is highly personal for you – for example, that you will leave your children fatherless or motherless if you continue to smoke – the likelihood is that you will strive for greater certainty in the judgement you make than when the information is not personally relevant (see Eagly and Chaiken, 1993: 326–46).

Self-test: Which persuasion model includes systematic and heuristic processing routes?

Key factors in central/systematic and peripheral/heuristic processing

Irrespective of name, the ELM and HSM are consistent in that they both propose two mechanisms in the processing of persuasive communications. They argue that when a persuasive communication is encountered people will process the information in either an effortful way (central and systematic) or a less effortful way (peripheral and heuristic). But what common factors account for which processing route we take?

One factor concerns whether the topic of persuasion is actually important for us or, to put it another way, whether the outcome of persuasion is likely to have a positive or negative impact on the person being persuaded. Martin and Hewstone (2003) showed how this personal relevance factor interacted with whether the message was framed as being consistent with a majority group opinion or a minority group opinion (see Chapter 25 for more on majority and minority group influence). The findings suggested that, when exposed to a message that implied a negative personal outcome, only under conditions in which participants believed that the majority agreed with the message did they process information centrally. Why? Because being confronted with a majority position that has an associated negative outcome leads to curiosity and greater engagement with the message. On the other hand, a minority position that also has a negative outcome is ignored because people are motivated to protect self-esteem and leads to peripheral processing.

Mood state is important for dissociating between central and peripheral processing. Unhappy people tend to use more central processing and happier people peripheral processing. It is argued that when presented with a persuasive message unhappy people interpret their sad feelings as an indication that something needs to be solved or addressed. This leads to a redistribution of attention towards the threat and thus to process information centrally (Bohner et al., 1992). Presenting information slowly is also likely to lead to greater central processing. If a persuasive message is verbally delivered quickly people are more likely to make their response based on the number of arguments heard. In other words, they do not listen to the arguments themselves and process using heuristics only (Bohner and Wänke, 2002).

Another factor is called *need for cognition* (Haugtvedt and Petty, 1992) and refers to the tendency for some people to 'think' more about information they encounter in their everyday lives. These types of people are more likely to use systematic or central processing compared with those with low need for cognition who use peripheral strategies. Another individual difference-based factor is self-monitoring. People who self-monitor or are preoccupied with what others think about them are more likely to use the central route when presented with a persuasive communication (Snyder and DeBono, 1985).

Fear appeals

Another approach to persuasion and attitude change, which has been the focus of considerable work over the past 50 or so years, is that based on what are called fear appeals. Fear appeals have been used over the years to try to stop people from performing behaviours, like smoking, that will have negative effects on their health.

The assumption here is that the fear aroused in a person will motivate them to change their attitudes and behaviour. Evaluations of fear appeals suggest, however, that they are not always successful in changing (Witte, 1992) and some have questioned the effectiveness of evoking fear when attempting to persuade individuals to change (Ruiter et al., 2001).

Nevertheless, McGuire (1969) conducted many studies in which he altered the levels of fear evoked by different messages. He found that the relationship between the amount of fear aroused and the degree of attitude change

Smoking kills

Photo 22.2 Would you be put off?

was best represented by an inverted U-shaped curve (see Figure 22.7). This means that when too little or too much fear is evoked there is weak attitude or behaviour change, but that moderate doses of fear bring optimal levels of change.

Why is this the case? Well, when only a low level of fear is aroused, the message fails to grab the attention of the perceiver and when fear is extreme, attention to the message will be adversely affected. This is because the individual is diverting cognitive resources to dealing with the negative arousal (e.g. anxiety) produced by being frightened. The challenge is to produce messages that involve neither too much nor too little fear, so that a person attends to the message and does not have to divert resources away from the message to deal with the fear.

Self-test: What is the inverted U-curve hypothesis?

Fear appeals have been present in many models developed to understand decision-making processes about health behaviours. Examples here include the health belief model and protection motivation theory (see Conner and Norman, 1996; Rutter and Quine, 2002).

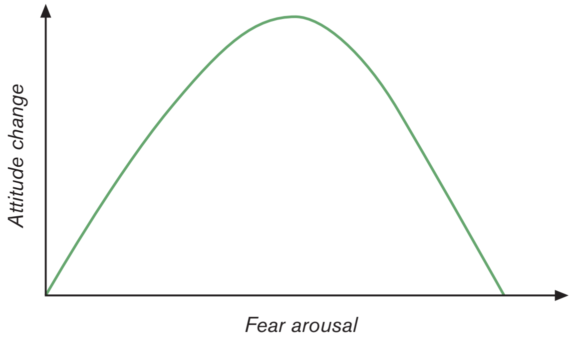


Figure 22.7 McGuire's inverted U-shaped curve hypothesis for describing the relationship between levels of fear and attitude change

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe how the concept of attitude has been defined.
2. Describe why we have attitudes and what functions they serve.
3. Describe how attitudes are structured.
4. Describe how attitudes develop according to principles based on learning theory.
5. Describe various direct and indirect measurement techniques that are used to study attitudes.
6. Critically assess theories and models that have been used to understand the belief–behaviour relationship, such as the theory of planned behaviour.
7. Discuss 'consistency' approaches that attempt to explain how attitudes change, including balance theory and cognitive dissonance.
8. Evaluate models that have been proposed for explaining how people are persuaded to change their attitudes, such as the elaboration likelihood model.
9. Evaluate how applied psychologists have adopted attitude change theory for understanding and changing health behaviour.

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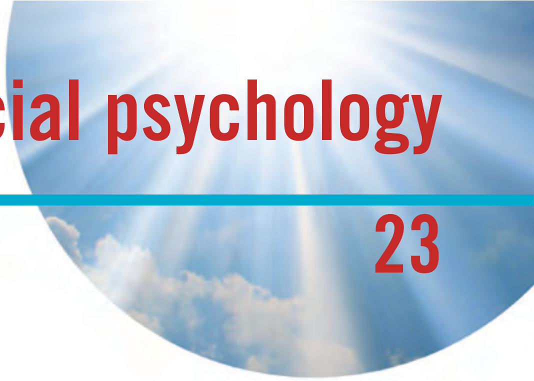

23

Attribution

Route map

The aim of this chapter is to present you with an introduction to many of the theories and models psychologists have developed to explain how people attribute behavioural outcomes to different types of cause. We will explore the nature of the attribution process by looking at a number of different models. We will focus on what attributions ‘look like’ and the circumstances that lead to different kinds of attributions. The second part of the chapter will focus on various errors and biases that result from the attribution process.

Introduction

Imagine that you are walking along the street one night after a good time at the local pub. The street is fairly empty and it is getting late. Walking towards you are two people who are talking with each other. Just as they pass you, both begin to laugh but continue staggering down the road.

In this instance, you would probably be thinking to yourself ‘*Why* did they laugh? What possible reasons could there be for these people to behave in the way they did? Did they laugh because of the way I look? Did they laugh because one had just told the other an amusing story and it was just coincidence that they passed me at that time? Did they laugh because they had been drinking too much and that’s what drunk people do? Did they laugh because they are rude people who try to embarrass perfect strangers?’

This example shows that we search for answers to these ‘why?’ types of question and invariably arrive at a conclusion for understanding what could have possibly caused another person’s behaviour. We don’t just register the events we experience; we try to explain them as well. We search for explanations of events in our social world. Every day we are exposed to situations or information that require us to try to understand causes for events. In this sense forming attributions, or going through the psychological processes that allow us to offer explanations for events, is a *commonsense activity* (see Heider, 1958). We have a desire, or are motivated, to understand cause-and-effect relationships in our social world in order to derive meaning about events (van Overwalle, 1998).

We can all easily give examples of when we have made attributions and, if we think about it (see Activity box 23.1; see Focus point 23.1), whether the attributions we make are consistent or can be grouped into different types.

Psychologists over the years have been concerned with uncovering those factors that are important for individuals arriving at explanations for observed events. The kinds of question they have been concerned with include the following:

- What types of information do people use in explaining events?
- How do we process this information?

This causal attribution process is inferential. We infer effects (e.g. how a person behaves, what they say, how we feel) by attributing them to causes. In the example at the beginning of this chapter, you might conclude that the people are laughing for external reasons, such as the effects of alcohol, or for more internal reasons like they are just ‘rude’ and ‘nasty’ people.

Understanding the reasons for people answering the ‘why?’ questions is the cornerstone of attribution theory (Försterling, 2001). Attribution theory is concerned not only with how we explain other people’s behaviour but also how we explain our own. Strictly speaking, it is a collection of mini-theories that together go some way to explaining how we ourselves account for events (Gilbert, 1998). Attribution theory is not concerned with *actual* causes for our own or another’s behaviour but focuses specifically on *perceived* causes.

As we shall see, research and theorising on attribution has a long history, in excess of 50 years. Attribution has played a major role in the development of social psychology, and its principles have been employed in many applied psychology disciplines including clinical, organisational, occupational, forensic and educational psychology.

ACTIVITY BOX 23.1

Attributing causes to events: being a jury member

Imagine you are a member of the jury on a manslaughter trial in which a man has been charged with killing his partner with a lethal injection of cyanide. At the trial you learn that the deceased was suffering from terminal cancer and that this was causing her extreme pain. In fact she only had a few months to live after diagnosis and had been begging her partner to help her die quickly. Why do you think the man conformed to his partner's wishes and killed her?

Now write down as many causes as you can for the partner's behaviour. After doing this, try to work out which of the causes are about the partner (internal attribution) and which are about the situation (external attribution). Based on the information you have and the causes you have listed, would you find the partner guilty of manslaughter or not? What reasons would you give for your decision?

FOCUS POINT 23.1

Definitions of attribution

'Attribution research . . . is concerned with the particularity of human beings to perceive the causes of events and to make causal inferences' (Försterling, 2001).

'. . . the process of assigning a cause to one's own or another's behaviour' (Hogg and Vaughan, 1995).

'. . . the attempt to identify what factors give rise to what outcomes' (Fiske and Taylor, 1991).

'The process through which we seek to identify the causes of others' behaviour and so gain knowledge of their stable traits and dispositions' (Baron and Byrne, 2003: 49).

In this chapter, we will take a look at various theories and approaches that have been proposed so that we can build a picture of how people attribute causes to events. As you will see, some of these theories focus on very distinctive aspects of the attribution process. What they have in common is that they use a mainly cognitive approach for understanding causal attribution. These approaches focus on how people select, store, recall and evaluate relevant information (in other words, how they process such information) and how they utilise this information in making causal decisions.

Recently, however, discursive psychologists have introduced other approaches to understanding causal attribution (for more information, see Gough and McFadden, 2001; Stainton Rogers, 2003). In general, however, social psychologists have attempted to provide answers to a number of broad questions concerning the attribution process (see Fincham and Hewstone, 2001; Försterling, 2001). These are as follows:

- What are the main characteristics of the attributions we make?
- Under what circumstances do we make attributions?
- How do we make attributions for our own and other people's behaviour?
- Are there any biases in the attributions people make and are these biases systematic? Are these biases universal across people?

This chapter will present you with theories, models and evidence that have been developed to address these issues. Our starting point is a look at the various theories that have been proposed to explain the causal attribution process. We begin with Fritz Heider's work, which is generally perceived to be the foundation of attribution theory.

Heider's 'commonsense' approach

In *The Psychology of Interpersonal Relations*, Heider (1958) proposed an approach that took as its starting point the idea that 'everyday' humans are naive scientists (see Chapter 21). He meant by this that people link observable behaviours to unobservable causes. These causes are perceived and it is these perceived causes that give meaning to what people (and themselves) do, not the actual behaviour itself. Heider argued that it is therefore fundamental to 'know' what others believe because, by knowing these beliefs, we can understand their behaviour and also predict their future intentions and behaviour.

Self-test: Is attribution theory about actual or perceived causes of events?

Two fundamental propositions were derived from Heider's commonsense approach. The first concerns the idea that, when making causal attributions, people frame their responses in terms of reasons either internal or external to the observed person. Heider was the first to make the explicit distinction between internal and external causes. Some authors use the term dispositional causes to refer to internal causes and situational causes to refer to external causes.

Heider believed that when making an attribution the person is actively trying to work out whether the behaviour they have seen is something to do with the observed person themselves – for instance, effort, ability or mood – or about things external to the person – for example, how complex a task is or what the weather was like. Internal causes lie within the individual while external causes lie in the environment around the individual. People use these types of attribution to make their world more predictable or controllable.

FOCUS POINT 23.2

Do inanimate objects have motives and intentions?

Heider and Simmel's (1944) participants watched a series of short films that involved a number of geometrical shapes. For instance, one of these films showed a large triangle (T), a small triangle (t), a circle (C) and a rectangle (R) (see Figure 23.1). The rectangle had one section that opened and closed like a door or gate. The film showed the triangles and circle moving about in different directions and at different speeds. The rectangle was stationary. After watching the film participants were asked to report 'what they saw'.

The striking result of this experiment is that virtually all the participants reported seeing intentions and motives in the behaviour of the shapes, and also that these intentions and motives were seen as being the property of either humans or animals. In addition, people attributed personal traits to these characters. For instance, one participant reported that:

> Triangle number one shuts his door (or should we say line), and the two innocent young things walk in. Lovers in a two-dimensional world. No doubt, little triangle two and sweet circle. Triangle one . . . spies the young love. Ah! He opens his door, walks out to see our hero and his sweet. But our hero does not like the interruption . . . he attacks triangle one rather vigorously.
>
> (Originally reported in Heider and Simmel, 1944: 247; reprinted in Försterling, 2001: 29.)

This shows how people seem to structure a number of unconnected events involving objectively inanimate objects into a meaningful sequence of events involving people or animate objects with intentions and motives.

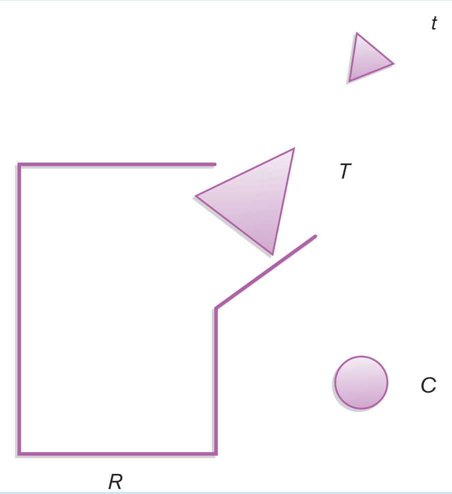

Figure 23.1

Heider's second main idea was that, when making an attribution, people tend to favour using internal or dispositional attributions for explaining another's behaviour. They seem to ignore – or at least downgrade – the role of situational or external causes. He noted that explaining another's behaviour in terms of their personal motives or intentions (internal causes) is seen as 'final causes', in that we are usually satisfied with an explanation grounded in a person's motives. We are less inclined to ask any more questions.

Focus point 23.2 shows Heider and Simmel's (1944) classic geometrical figure experiment, which demonstrates the general tendency to make attributions to personal motives and intentions.

As we shall see in the following sections, Heider's ideas have been the focus of much experimental work by social psychologists and the basis of other theories of attribution. One such theory is Jones and Davis's (1965) correspondence inference theory.

Self-test: What are dispositional causes and situational causes?

Jones and Davis's correspondence inference theory

This theory focuses on how people make judgements about the dispositions of other people. It is specific to understanding how we use the observation of another person's behaviour (i.e. the actor) to infer dispositional attributions of that person.

According to Jones and Davis, the behaviour of the actor is not the only source of information we use in making the judgement – we also observe the effects the behaviour has. In addition, the theory assumes that the actor has knowledge about the effects of their action or behaviour. Also, this approach assumes that the actor has the ability to produce the action with the desired effect. One problem with the theory is that it does not specify how we understand that an actor has knowledge of the effects of an action and also the ability to produce the desired effects.

As you have no doubt guessed, central to the theory is the idea of correspondence. Jones and Davis believe that the ultimate goal in attribution is to make correspondent inferences. What does this mean? Basically, the assumption is that people need to be able to infer that the behaviour, and also the intention that led to the behaviour, *correspond* to some underlying dispositional characteristic(s) within the individual. These dispositional characteristics are a stable feature of the person.

Correspondence is high when we think, or believe, that the behaviour (with its effects) reflects completely the underlying disposition. For example, on seeing a person help a mother and baby in a pushchair up some steps, we are likely to infer that this person is 'caring, unselfish and kind' – the behaviour and the disposition correspond with one another. Similarly, correspondence is high if we see a person walking past and ignoring a mother trying desperately to get her baby and pushchair up some steps. We would be likely to infer that this person is 'uncaring, selfish and unkind'. By the same token, if we are not certain or other information is available that casts doubt on the reasons for the behaviour of the actor, correspondence is low. For instance, it could be that the only reason the actor helped the person carry the pushchair up some steps is because they were forced to by another person.

What predicts whether correspondence is high or low? One factor is called the analysis of non-common effects. The idea here is that the observer believes that in a given situation the actor has alternative actions available to the one seen. People are assumed to compare the different possible actions in terms of the effects each would have. A common effect is one that would be reached irrespective of the action alternatives, whereas non-common effects are specific to the behaviour observed.

Pennington (2000) provides us with a nice example of the operation of these effects. He offers a scenario in which there are two cinemas that are equidistant from your home. These cinemas are both showing the same film that you want to see. One cinema sells the brand of ice cream you really like, the other does not. You, of course, choose to go to the cinema that sells your favourite brand of ice cream. The non-common effect in this example is that you get to eat your favourite ice cream while watching the film. It is these non-common effects, and how desirable they are, that are used to make inferences about intentions and dispositions. When non-common effects are high, correspondence is low, and vice versa.

This analysis of non-common effects can lead to ambiguous interpretations. For this reason, it is argued that we use other factors in arriving at a dispositional attribution. We are likely to make a dispositional attribution when the behaviour is *not* socially desirable. This relates to the norms in behaviour associated with different situations. When someone behaves in a manner that does not reflect the preconceived norms of the situation, we are likely to infer that things internal to them (a dispositional explanation) have caused the behaviour.

We also make dispositional attributions when we observe a person behaving in a way that is at odds with the role we perceive of them: imagine seeing a member of the clergy dancing all night at a rave. Our past experience with a particular individual's behaviour in particular situations is also important. The question we ask in this case is, 'Is their behaviour typical of them?' An example here could be bumping into your mother or father at a nightclub one evening, even though 'parents never go out'. If the behaviour is atypical we usually explain their behaviour in terms other than dispositions – such as situational factors.

Photo 23.1 What can explain this person's behaviour?

Self-test: Outline correspondence inference theory.

We will now turn to approaches that consider the preconditions for making internal (dispositional) or external (situational) attributions.

Kelley's covariation and configuration models

What information is required to make a causal attribution? To answer this question, Kelley (1967, 1973) developed two accounts of the attribution process. These accounts differ in the amount of information needed to make a causal attribution. The first comprises instances where we base our attributions on multiple observations, made at different times and in different settings. This is called the covariation model. The second comprises instances where we can only base our attributions on a single observation and is called the *configuration approach*.

The covariation account

Kelley proposed that to arrive at a causal attribution for another's behaviour, people try to work out which effects can be attributed to which of a number of factors. To do this, he suggested that we use the covariation principle. This states that, given time and motivation, a person can make attributions on the basis of perceiving the covariation of an effect and its hypothetical causes. The effect is attributed to the factor that is present when the effect is present, and absent when the effect is absent.

This model is also called the ANOVA approach (i.e. analysis of variance approach), which is a statistical test that looks for changes in a dependent variable (the effect) by varying independent variables (the factors). Kelley classified the potential causes of events as being located within the person (internal), the entity (external) and the circumstance (external). He also suggested that we use three kinds of causal information to arrive at the cause being accounted for by the person, the entity or the circumstances in which the behaviour took place. These are distinctiveness, consistency and consensus information.

Self-test: What is another name for Kelley's covariation model?

Let's demonstrate these types of information by using an example reported by McArthur (1972). He describes a situation in which a student called Neil falls asleep in Professor Brown's lecture. If we observe this behaviour the question we ask is, 'What could explain this behaviour?'

Distinctiveness

How distinctive is Neil's behaviour? Does Neil fall asleep in other lectures? In other words, we are asking ourselves the question, 'Does Neil behave in a similar way when confronted with other similar entities?' If the answer to this question is 'yes', then the behaviour is said to be low in distinctiveness – there is nothing special about Professor Brown's lecture. If the answer is 'no', then Neil's behaviour is said to be high in distinctiveness.

Consistency

How consistent is Neil's behaviour? Is he forever falling asleep in Professor Brown's lectures? A 'no' answer will imply low consistency and a 'yes' answer high consistency.

Consensus

Do other people behave in the same way as Neil? Did other people also fall asleep during Professor Brown's lecture? If other people fell asleep, consensus is said to be high but if only Neil fell asleep, consensus is low.

Kelley argued that high and low distinctiveness, high and low consistency and high- and low-consensus information vary with each other in specific ways that lead to either a person attribution (internal), entity attribution (external) or circumstance attribution (external).

Figure 23.2 gives the relationship between levels of the three factors and the attribution that will be made. For example, when Neil's behaviour is perceived as low in consensus (only he fell asleep) and low in distinctiveness (he falls asleep in other lectures in other subject areas) but high in consistency (he is always falling asleep in Professor Brown's lectures), then the cause of Neil's behaviour is located within him (i.e. 'Neil'). An internal attribution, like 'Neil can't help but stay out too late at night', has been made. Any other combination of the factors will result in an external attribution about the entity (e.g. Professor Brown being a boring lecturer) or the circumstances (e.g. it being particularly hot in the lecture theatre) being made. When consistency is low, people will discount one potential cause and look for another potential cause of the behaviour.

Evaluation of Kelley's covariation model

While empirical evidence has been offered in support of the general principles of the ANOVA model (e.g. McArthur, 1972), it is not without its critics (e.g. Cheng, 1997). One criticism suggests that not all types of causal information are used all of the time in arriving at causal decisions. For instance, Nisbett and Borgida (1975) found very weak effects for consensus information. They argued that people are less likely to use information based on base rates (which have to form the basis of consensus-related information) and are more likely to use information based on the observed person at that time.

Hilton and Slugoski (1986), in their abnormal conditions focus (ACF) model, proposed that people make causal attributions from consistency, distinctiveness and consensus information by selecting as a cause the condition that is 'abnormal' when compared with the background of the behaviour. In other words, people use the three sources of information as contrast cues. So high-distinctiveness information ('the target person does not act in this way to other similar entities') is used as a cue for the entity as being 'abnormal', low-consensus information ('not many other people do it') for the target person as being 'abnormal', and low consistency ('the event has hardly ever happened in the past') as the circumstances being 'abnormal'.

Another problem with the covariation model is that it requires multiple observations to draw together consistency, distinctiveness and consensus information, whereas in the 'real world' this may not always be the case. This questions the covariation model in terms of its rather idealistic approach. Kelley (1972) recognised this and so produced another model that was designed to understand causal attribution based on a single observation – the configuration model.

The configuration account

In cases where there is incomplete data on which to base consensus, distinctiveness and consistency information, Kelley proposes that we use causal schemata. These are incumbent beliefs and preconceptions about how causes interact to produce particular effects, and are derived through experience. One such schema is known as the multiple sufficient causal schema, which suggests that any of a number of potential causes acting by themselves can produce the same effect.

For instance, what caused the England football captain David Beckham to transfer to Real Madrid in the summer of 2003 can be explained by a number of potential causes (better money, playing with the best footballers in the

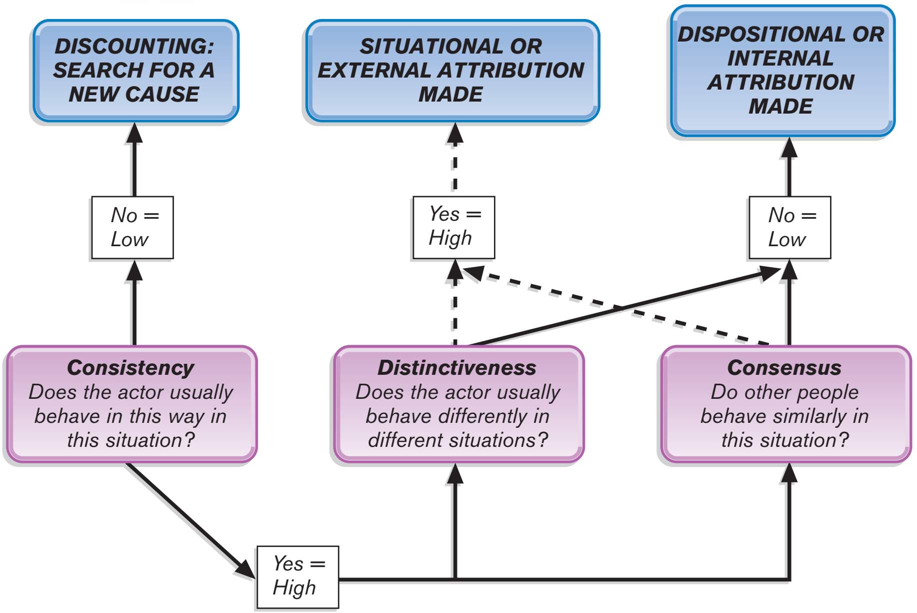
DISCOUNTING: SEARCH FOR A NEW CAUSE
SITUATIONAL OR EXTERNAL ATTRIBUTION MADE
DISPOSITIONAL OR INTERNAL ATTRIBUTION MADE
No = Low
Yes = High
No = Low
Consistency
Does the actor usually behave in this way in this situation?
Distinctiveness
Does the actor usually behave differently in different situations?
Consensus
Do other people behave similarly in this situation?
Yes = High

Figure 23.2 Kelley's covariation, or ANOVA, model of causal attributions

world, pressure from his wife to move to a sunnier climate, etc.), all of which are sufficient causes in their own right.

There are also attribution principles attached to these schemata. The one attached to the multiple sufficient cause schema is known as the discounting principle. This suggests that because distinct causes can create the same effect, the role of one of the causes is discounted if possible alternative causes are present. For example, we are likely to discount the idea that a friend of yours failed to turn up at the pub to celebrate your birthday because they are selfish and inconsiderate if we also learn that they had been taken seriously ill that day.

Another principle is called the augmentation principle. This suggests that the role of a cause is augmented, or increased, if the effect occurs at the same time as an inhibitory cause. For instance, a friend who turns up at the pub to celebrate your birthday even if they are ill that day may be thought of subsequently as more considerate and selfless (an internal attribution) than one who also turns up but who is not ill. This principle applies to the multiple cause schema and also another schema called the multiple necessary cause schema. This proposes that causes operate together to produce the effect, and is especially important when events are unusual or extreme (Cunningham and Kelley, 1975).

Self-test: What does Kelley's configuration account explain?

Weiner's attribution model of motivation

Weiner (1986, 1995) focused specifically on attributions of success and failure as means of examining human motivation and its relationship to emotion. He suggested that the attributions we make result in identifiable emotional responses (Weiner, 1985). His approach is important because it takes the traditional internal/external perceived causes idea of Heider and Kelley and adds two other dimensions that interact with it and with each other to provide an understanding of the structure of perceived causality.

Weiner, then, suggests that three causal dimensions are used to predict the types of attribution made. *Locus* concerns whether the cause is perceived as being internal or external to the actor; *stability* refers to whether the causes are temporary or permanent in nature; and *controllability* concerns whether the cause is perceived as being controllable or uncontrollable. It is the covarying nature of these factors that will predict the attribution for success or failure, and how one will feel as a result.

Let's take an example here. Imagine you have just been given a very poor mark for a recent assignment. You could attribute the mark to the fact that you found the assignment very taxing and particularly difficult. If this is the case you are likely to have made an external, unstable and uncontrollable attribution that will leave you feeling rather frustrated and angry. Another option is that you may attribute your poor performance to a general lack of ability. This is an example of an internal, stable and uncontrollable attribution that will make you feel rather gloomy or ashamed.

Weiner's basic premises are summarised in Figure 23.3. You will see that the diagram identifies what are called outcome-dependent affects. These are the primitive emotions that may be elicited without thought as a result of success or failure at a task. For instance, irrespective of the attribution process, people will feel sad or frustrated after failing but happy and content after being successful. They are outcome dependent because they depend on the attainment of, or failure to attain, a desired goal (they like to

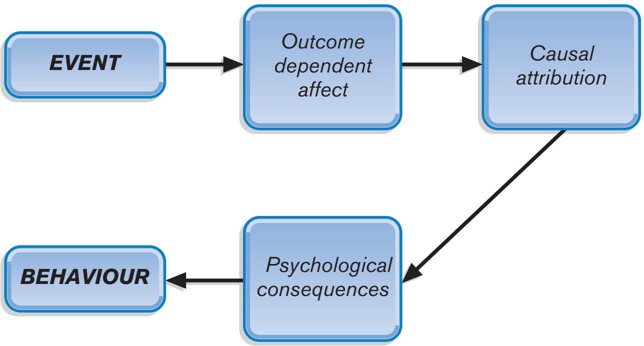

Figure 23.3 A summary of Weiner's model

succeed in getting a good mark for an assignment) and not the causal attributions themselves. As we see in this example, the causal attribution process has psychological consequences including emotional ones and the expectancies we might have for our own achievement in the future.

More recently, Weiner (1995) has taken his approach and applied it successfully to attributions of responsibility and blame. For example, if we judge the cause of the behaviour leading to a road accident as internal, controllable and either stable or unstable, we will make the driver of the vehicle responsible or to blame.

Applications box 23.1 provides a brief overview of other work that has used attribution principles in understanding blame and responsibility.

Although a significant amount of supportive evidence has been reported for this theory (see Weiner, 1995), it has been criticised by others. Some have provided evidence that people do not necessarily classify ability, effort, luck and task difficulty in terms of stability, controllability and internal/external properties. For instance, Krantz and Rude (1984) found that many people classified ability as unstable.

Self-test: What types of attribution was Weiner interested in?

Section summary

The attribution theories we have looked at in this chapter can be seen as presenting different approaches to the study of attribution and all have distinct foci. Correspondence inference theory is concerned with explaining dispositional attributions, while the covariation model addresses instances in which people have been presented with detailed information about a person's behaviour and the behaviour of others over time. Both these approaches are

APPLICATIONS BOX 23.1

Attributing blame and responsibility

Ever been involved in a road accident, however minor? If you have, you will know that insurance companies are always interested in who is to blame for an accident. Sometimes the police too are interested in trying to work out who is to blame. If you are to blame, your insurance premium goes up and driving becomes that bit more expensive. In general, internal attributions result in a person being held responsible for an outcome. External attributions result in blame being ascribed elsewhere, like the poor state of the road causing a puncture.

One approach to understanding attribution of responsibility comes from Shaver (1985), who identifies a number of factors that govern whether or not an internal attribution is made. These are:

- whether the behaviour can be deemed as originating from a specific person
- if there is no justification for why the behaviour was adopted in the first place
- a belief that the actor could have predicted the consequences of their behaviour
- that the actor had free choice in behaving in the manner they did.

Take the example of a driver who is involved in an accident when he is over the drink-driving limit; assume that the other driver was sober. In this instance, we are likely to attribute blame to the drink-driver and think of that person as being 'dangerous', 'untrustworthy' and a 'menace to other road users'. Why? Because we can identify a specific person involved in the accident who is over the limit, we do not know why the person chose to drive after drinking in the first place, we think that this driver is well aware that alcohol impairs driving performance and they could have chosen not to drink that day.

It has also been shown that severe outcomes lead to more responsibility being placed on the actor. A number of studies focusing on driving behaviour have found that attributions of blame and responsibility increased as severity of the outcome of the road accident depicted increased (e.g. Dejoy and Klippel, 1984; Kelley and Campbell, 1997).

Other psychologists have shown that responsibility attributions decrease if you believe yourself to be similar to the actor (Burger, 1981). Wilson and Jonah (1988) showed that drink-driving offenders reported decreased attributions of blame to hypothetical drink-drivers when compared with the attributions made by non-drinking drivers. This is an example of a defensive attributional bias.

likely to require deliberative (effortful) thinking (see later). In comparison, the configuration model is based on causal schemata and may be more prone to spontaneous (non-effortful) thinking.

We have now covered the most influential theories of attribution. One issue that does arise from the theories seems to be the inherent assumption that the attribution process is a deliberative one, requiring significant cognitive effort. Is this the case or does the nature of the attributional process go beyond effortful, conscious deliberative thought and into the realms of spontaneous attributions?

Spontaneous and deliberative attributions

The conditions that give rise to either spontaneous or deliberative attributions have been the subject of more recent work. Spontaneous attributions are those that are made without the person consciously thinking about alternative causes. Stereotypes (see Chapter 21), for instance, might lead a person to make a spontaneous attribution. Some people hold the stereotype that young drivers are irresponsible drivers. This may lead a person spontaneously to attribute the cause of a road accident to a young person's dangerous driving without thinking about any contextual information, such as the fact that a tyre on their car might have blown and caused the accident and so on.

These types of attribution require little cognitive effort. Contrast this with deliberative attributions, which require us to expend significant cognitive effort in analysing and observing behaviour and the context within which it occurs. Langer (1978) was the first to claim that people were not at all times actively seeking causes, that a lot of attribution work was 'mindless' and that the process may in fact be fast acting and require only limited information processing (see Fincham and Hewstone, 2001).

Self-test: How do spontaneous and deliberative attributions differ?

Gilbert and colleagues' three-stage model for attribution

In this model, Gilbert *et al*. (1988) and Gilbert (1998) propose the attribution process to be a sequence of events involving (i) an initial identification phase, followed by (ii) an automatic (spontaneous) attribution phase, which in turn is followed by (iii) an effortful (deliberative) attribution phase (see Figure 23.4).

A series of experiments showed that after identifying or perceiving a behaviour or event a person will then enter an attribution process characterised by a spontaneous operation requiring limited cognition (Gilbert *et al*., 1988). The likelihood is that this automatic phase will result in a dispositional attribution. Indeed, studies have shown that trait inferences are made very quickly (Smith and Miller, 1983).

The second stage in the attribution process is characterised by being more cognitively taxing and deliberative. According to Gilbert and colleagues, this stage results in what they call situational correction. In other words, the person realigns their attribution on becoming aware of other relevant information about the situation within which the behaviour occurs.

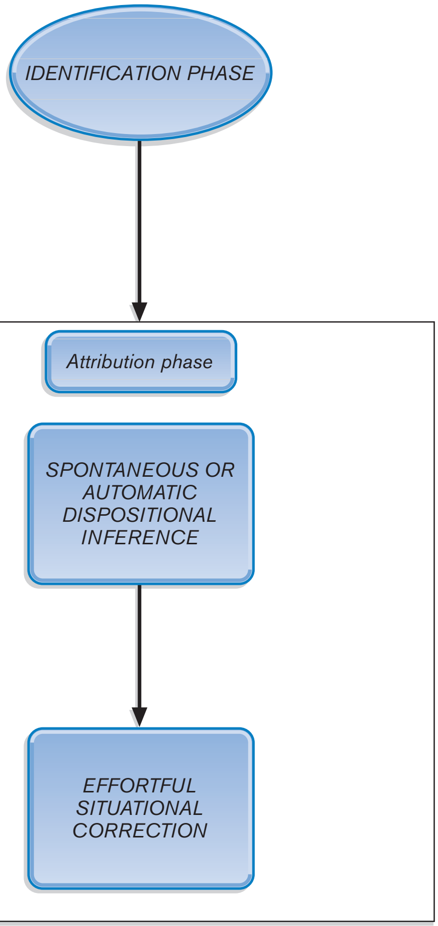
IDENTIFICATION PHASE
Attribution phase
SPONTANEOUS OR AUTOMATIC DISPOSITIONAL INFERENCE
EFFORTFUL SITUATIONAL CORRECTION

Figure 23.4 Gilbert's three-stage model of attribution (1995)

For instance, you may have originally thought that a road accident involving a young person driving fast was due to the irresponsible and dangerous way in which all young people drive – a dispositional attribution based on the stereotypical young driver. However, if you learn that the passenger in the car was the driver's pregnant partner who was in labour at the time, more deliberative processing will occur and you will realign your attribution to make a more situational attribution: the person was driving too quickly because he needed to get his partner to hospital as quickly as possible.

Self-test: Briefly describe Gilbert's model of attribution.

Attributional bias and errors

In this section, we are going to pose the question of whether there are systematic biases or errors in people's judgements of causes. What factors are important for understanding any such errors as systematic? Kelley's covariation model sees people as logical perceivers of causal information, who use standard ways of making inferences. However, it does appear that there are attributional biases that operate in predictable ways. In this section we will look briefly at correspondence bias, fundamental attribution error, ultimate attribution error, the actor–observer difference, self-serving bias and the false consensus effect.

Correspondence bias or the fundamental attribution error

Imagine that you are out at dinner with some people whom you do not know very well. One of your companions arrives 30 minutes late for the meal. On entering the restaurant he trips and falls over. After getting to his feet he comes over to the table and, while sitting down, knocks over a glass of wine. Later on during the meal the same person spills a cup of coffee over his clean white shirt.

How would you explain these events? In all likelihood you would come to the conclusion that this person is rather 'clumsy', and that his clumsiness led to his falling over, knocking over the wine glass and spilling the coffee.

Is this an accurate attribution to make? Not necessarily, because there could be other possible explanations for the events. Perhaps the floor of the restaurant was wet, causing the person to slip over when entering. Maybe he spilt the coffee because the cup was far too hot to hold. You could probably think of many possible reasons for these events.

The fact that you are not likely to consider these possible external causes has been labelled the correspondence bias (Jones, 1979). This is the tendency for people to explain others' behaviour as the result of (or corresponding to) dispositions even when information about possible situational causes is apparent or even more likely (see Gilbert, 1995). This bias is so general in scope that some psychologists call it the fundamental attribution error (FAE). This states that people tend to underestimate the role of situational (external) factors and to overestimate the role of dispositional (internal) factors in causing behaviour (Ross *et al.*, 1977; Ross and Nisbett, 1991). People tend to make internal attributions rather than external ones even when situational factors are likely causes (see Gawronski, 2005).

What factors are important in the operation of the correspondence bias? One motivational explanation argues that dispositional attributions give the perceiver *control* (Miller et al., 1978). An example here is the just world hypothesis (Langer, 1978; Lerner, 1980; Lerner and Miller, 1978). As a means of protecting their self-esteem, people have been shown to attribute negative outcomes to the victims themselves. When bad things happen to other people it is because they are bad people and deserve the outcome. We blame the victim. Why?

One cognitive explanation rests on the idea that a person's behaviour is more distinctive than the situational context in which the behaviour takes place (Rhodes and Pryor, 1982). In this sense, the person's behaviour is more *perceptually salient* in the mind of the perceiver, rather than the context in which the behaviour takes place. These explanations seem to assume that situational and dispositional attributions are totally distinctive. Others have provided accounts that see these attributions in a more sequential manner (see Gilbert's three-stage model, discussed earlier).

Although the evidence seems to be quite consistent with the FAE or correspondence bias, there are occasions on which people are more likely to attribute causes to situational rather than dispositional factors. These include when attention is focused on situational information, when the observers are in a negative mood, highly motivated or when behaviour is inconsistent with the perceiver's expectations (see Gilbert, 1998).

The ultimate attribution error

In effect the ultimate attribution error is a version of the fundamental attribution error that acts as a function of group membership. The types of attribution we make are dependent on our group membership and how our in-groups interact with other out-groups (Pettigrew, 1979). (See Chapter 25 for a discussion of in-groups and out-groups.) Work has shown that there is a tendency for people to make attributions for their in-group that serve to protect and enhance group membership and also make more deprecating attributions for the behaviour of out-groups. Positive behaviour for the in-group is attributed to internal attributions of the group but for the out-group the same behaviour is attributed to external factors. In the same way, negative behaviour for the in-group is attributed to external causes and for the out-group to internal sources. For instance, Hunter et al. (1991) showed that Northern Irish Catholic participants were more likely to make external or situational attributions for Catholic violence and more internal or dispositional attributions for Protestant violence. Similarly, Protestant participants displayed external attributions for Protestant trouble and internal attributions for Catholic violence.

Actor–observer differences

This is when people assume that their own behaviour is caused by situational factors, and other people's identical behaviour is determined by dispositional factors (Jones and Nisbett, 1972). For instance, if you see another person trip over, you are likely to attribute this to their being clumsy or inattentive (internal or dispositional). If you yourself trip and fall over, you are more likely to attribute this to an uneven or slippery pavement (external or situational).

There is an obvious difference in the type of attribution we make about ourselves as the actor (situational) and those we make about others as actors (dispositional). Why are there these actor–observer differences? One account argues that there is greater information available to self-raters. We know more about our own behaviour than about the behaviour of others.

Another account proposes that the effect is due to greater attention being focused on situational factors when judging causes of our own behaviour and attention being more behaviour oriented when we attribute cause to others' behaviours (Storms, 1973). Storms (1973) showed this by making situational factors more salient and attention grabbing for the observer and dispositional factors more salient for the actor, which resulted in a reversal of the effect.

Self-serving biases

These biases refer to the tendency for people to take credit for any successes they have by making a dispositional attribution (e.g. to do with ability) and, in the case of failure, deny any responsibility and make a situational attribution (Fiske and Taylor, 1991). Taking credit for a success is an example of the self-enhancing bias, and denying responsibility for failure an example of self-protective bias. These biases have been explained in motivational terms as the need to maintain self-esteem and protect one's ego (Zuckerman, 1979; Taylor and Brown, 1988). (See Class activity box 23.1.)

An interesting extension to these biases is the idea of self-handicapping (Jones, 1990). In order to make the link between their performance and evaluation more unambiguous, people will often manipulate the causes of an event before it has occurred. For example, if we expect to fail an exam, we might therefore stay out very late at a nightclub the night before we are due to take it. This provides a self-serving explanation for the predicted failure.

These biases all operate at the individual level. Hewstone (1989) has also identified such biases as existing in groups of people. In-groups (those you identify with) favour dispositional attributions for success, whereas out-groups tend to have situational causes attached to their behaviour. This group-level bias has been called ethnocentric bias or group-serving attributional bias.

CLASS ACTIVITY BOX 23.1

On being self-serving

Take a sheet of paper. Draw a line vertically down the sheet of paper to make two equal columns. Label the first column 'Strengths' and the second column 'Weaknesses'. Next, spend two minutes writing down as many 'strengths' that you think you have. Do the same for 'weaknesses'. After this, count up the number of strengths that you reported and also the number of weaknesses. In groups, count up the overall number of strengths reported and the number of weaknesses reported and divide these by the number of people in the group. This will give you the mean number of strengths reported and the mean number of weaknesses reported. Is the mean number of strengths greater than the mean number of weaknesses?

Then read the section on self-serving biases. Discuss in your groups why it is that more strengths than weaknesses were listed.

APPLICATIONS BOX 23.2

False consensus effect (FCE) in drug use

Drug and alcohol use among young people is not uncommon. Some studies have found that children as young as 13 have taken illicit drugs (e.g. Miller and Plant, 1996). Wolfson (2000) studied the FCE in 350 university students who were classified as being either drug users or non-drug users. Participants estimated the prevalence of drug use among other students.

In line with the FCE, drug users gave higher estimates of drug use than non-drug users, who in turn increased their estimates of non-drug users compared with drug users. It seems that students are motivated to exaggerate relatively the behaviour of others to favour their personal behaviour.

The false consensus effect (FCE)

Ross *et al*. (1977) demonstrated that people tend to overestimate how many of their own behaviours, attitudes and beliefs are shared by other people (false consensus effect (FCE)). In their study, students were initially asked if they would walk around the university wearing an advertisement stating 'Eat at Joe's'. Of course, some refused and some agreed. Those who refused stated that the majority, or consenus, of other students would also refuse. Those who agreed estimated that the majority of other students would also agree. These types of consensus are not actually possible and have to be false – the majority of people cannot, at the same time, refuse and accept the same request. People tend to think that other people agree with them. The availability heuristic has been used to explain this effect (see Chapter 21). Our personal beliefs are the most easily recalled or available to us when making judgements like these. It is no surprise that our judgements concerning how other people will think about an object or event are influenced by how we ourselves think about that object or event.

These findings have been confirmed in many other areas, including attitudes related to body shape in women (Muller et al., 2002) and perceived prevalence of drug use (Wolfson, 2000) (see Applications box 23.2).

One explanation for the FCE argues that our own beliefs, attitudes and so on are at the forefront of our own minds. We know them and experience them, and as such they are salient. Encountering others who hold similar views acts to reinforce this saliency, which has the effect of creating the impression that more people than are objectively realistic hold the same opinions. A motivational account focuses on the idea that one good way to manage, maintain and enhance our self-esteem is to believe that other people hold similar views to ours (see Fiske and Taylor, 1991).

Self-test: Name three attributional biases.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe what is meant by the term 'attribution'.
2. Describe different types of attribution people make and give examples of these types of attribution.
3. Critically assess a number of attributional models and identify various similarities and differences between them.
4. Describe and evaluate the differences between deliberative and spontaneous attributions.
5. Describe a number of errors and biases in the attributional process that have been of interest to social psychologists.

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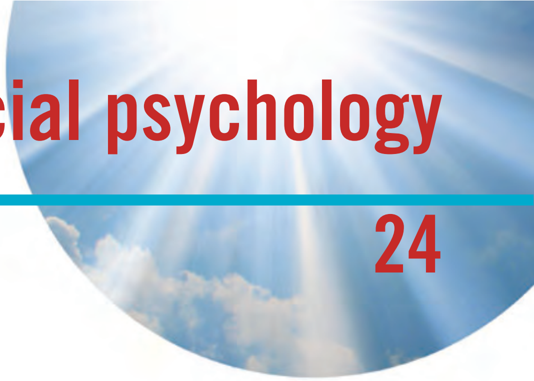


24

Impression formation and social interaction

Route map

The aim of this chapter is to provide you with an overview of some of the theories and evidence that social psychologists have used to study impression formation and social interaction. The chapter will begin with a section on how we form impressions of others and also why we attempt to manage the impressions others form of us. The second part of the chapter will look at nonverbal communication in social interaction. Finally, we will move on to look at a few examples of social behaviour including attraction, aggression and helping.

Introduction

People spend an awful lot of time thinking about other people. We spend a large proportion of our waking life forming impressions of new people we have met or just heard about or rejigging our opinions of people we already know. One way we do this is through social interaction. We meet people all the time, we talk to them and we 'behave' with them. Aside from language, we also use nonverbal skills to tell people what we think and feel, and also interpret what others think and feel from what they do.

Of course, forming impressions and interacting with other people go hand in hand. On one side of the coin, the way we think about people can be influenced by the impression we have formed of them. On the other side, interpersonal interaction with people can also provide us with information that allows us to adapt our impression of them, the impression we subsequently have of other people who are similar to them and also the way we behave towards them.

In extreme circumstances, the impressions we have formed of people and the result of interpersonal interaction with them can result in either aggressive or loving thoughts and behaviours. In other instances, the impressions we have of people can also result in whether we would help that person in the future.

Why do we form impressions and take part in social interaction? We do so in order to understand and predict other people's behaviour. For some this is important because it gives the social world 'meaning' for us (Fiske and Taylor, 1991). (The social cognition section in Chapter 21 outlines these ideas.) How do we form impressions of others? What governs our social interactions with others? What effects are there on our behaviour as a result of these processes? Well, that is what the rest of this chapter is concerned with. We will be studying some classic and contemporary evidence that has been used to answer the following questions:

- How do we form impressions of others in our social world? Do first impressions count?
- What factors are important for understanding how we form these impressions?
- How does nonverbal communication influence interpersonal perception and behaviour?
- Why are we attracted to some people but behave aggressively to others?
- Why do we decide to help people?

These types of question have been asked by social psychologists over the past 50 or so years.

Take a look too at the social cognition section (Chapter 21), the attitude section (see Chapter 22), the section on attribution processes (see Chapter 23), as well as those on social influence and group processes (see Chapter 25) for other processes that are important in understanding both the impression formation process and social interaction.

Impression formation

Social psychologists have been studying impression formation since the 1940s. They have primarily been interested in how we form initial impressions of other people, whether these impressions are permanent or stable

TABLE 24.1 ASCH'S LISTS OF WORDS FOR SHOWING THE INFLUENCE OF CENTRAL AND PERIPHERAL TRAITS

Central trait lists		*Peripheral trait lists*	
List A	**List B**	**List C**	**List D**
INTELLIGENT	INTELLIGENT	INTELLIGENT	INTELLIGENT
SKILFUL	SKILFUL	SKILFUL	SKILFUL
INDUSTRIOUS	INDUSTRIOUS	INDUSTRIOUS	INDUSTRIOUS
WARM	*COLD*	*POLITE*	*BLUNT*
DETERMINED	DETERMINED	DETERMINED	DETERMINED
PRACTICAL	PRACTICAL	PRACTICAL	PRACTICAL
CAUTIOUS	CAUTIOUS	CAUTIOUS	CAUTIOUS

and also how we try to manage the impressions others have of us (this last process is called impression management).

First impressions

Solomon Asch is the godfather of impression formation research. He argued that when forming an impression we use all available perceived information about a person in a dynamic way (see Activity box 24.1). This may include what they say, how they behave, how they are dressed and other nonverbal cues. Asch took an information-processing approach in his work. In his configural model, he suggested that we attend to specific pieces of information about a person when we are forming an impression. In particular, we attend to what are called central traits. This attentional or selection bias guides the impression formed and is fundamental to the content of it. Central traits affect the meanings of other identified traits and are also important for allowing us to perceive relationships between traits.

Asch also identified other more peripheral traits that people use but that are of far less importance for the impression developed. Although these are of less significance they too give meaning to other traits, but not as much as central ones. Together, central and peripheral traits guide the configuration of the impression formed.

Asch (1946) showed this effect in an experiment in which participants were presented with one of two lists of words (see Table 24.1), which described an imaginary person. From the table you can see that the only difference between List A and List B is one word, *warm* (List A) and *cold* (List B). After reading one or other of these lists, participants were then asked to rate the person, using a series of semantic differential scales (see Chapter 22 for a description of these types of scale), on dimensions such as generous or ungenerous, reliable or unreliable and happy or sad.

Those people presented with the *warm* list formed a very positive impression of the person; those in the *cold* condition a much more negative impression (see Figure 24.2). This finding has also been used to demonstrate the halo effect. If the information we get about a person is positive, we form a positive impression (a positive halo), while negative information brings with it a poor impression (a negative halo). In addition, when the words *warm* and *cold* were replaced with *polite* (List C) and *blunt* (List D), there was no difference in the favourability of the impression formed between the word list groups.

Asch interpreted these findings as supporting his view that the traits *warm* and *cold* act as central traits because they had such a major effect on the impression formed of the imaginary person. In comparison he concluded that words such as *polite* and *blunt* were more peripheral. They had much less impact on the impression formed or the attribution of traits to the imaginary person.

Although Asch's work is important, do the same processes occur in a more naturalistic setting? Is there support for the central–peripheral trait distinction when the person is not imaginary but real? The answer here seems to be 'yes'. Kelley (1950) demonstrated this by introducing students to a guest lecturer as being 'a rather warm (or cold) person, industrious, critical, practical and determined'. Half the participants were given the *warm* introduction, the other half the *cold* introduction. They were then actually lectured to by the person and afterwards asked to form an impression of him based on a number of evaluative dimensions.

Kelley's findings replicated those of Asch. Those in the cold condition rated the lecturer with more unfavourable traits, including unpopular, formal and unsociable, than those in the warm condition. Interestingly, the students'

ACTIVITY BOX 24.1

First impressions

You have probably all heard the adage ‘never judge a book by its cover’. What does this mean? Think about a person you formed an impression of before meeting them and then changed your opinion about after having met them. Write down some words that describe what you originally thought of that person. Now write down what your overall initial impression of that person was.

Did you find yourself basing your impression on certain key things like what the person was doing at the time, their appearance or what you had heard about them from other people? Maybe your impression was based on the fact that the person was in some way different from or similar to you? Maybe they held different political views to you, supported a different football team, or even wore the ‘right’ clothes? Whatever the reasons, you created an impression of that person and probably behaved in line with the impression you formed.

Now think about what happened when you actually met the person. Think about the occasion when you interacted with the person. Where were you and what were you doing? What went through your head? Think about how you behaved. Again write down some words that describe what you thought of the person and how the new overall impression was based on these descriptions.

Compare your new impression with the initial one. How different are the two sets of words used to describe the first and second impressions? What do you think made you change your mind? Was it something the person did, something they said or is it something you can’t put your finger on?

We form impressions because they help us to understand why other people are behaving in the ways they are and also to predict how they will behave in the future. Solomon Asch showed that first impressions are important and seem to be based on us focusing on certain key traits in people (see the section headed ‘First impressions’, opposite).

Take another look at the key characteristics you listed for this activity and work out how consistent or inconsistent some factors were in your first and second impressions of the person.

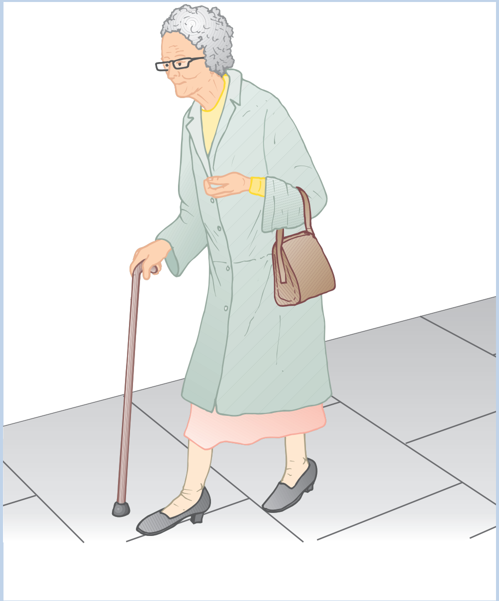


Figure 24.1(a) What are your impressions of this person?

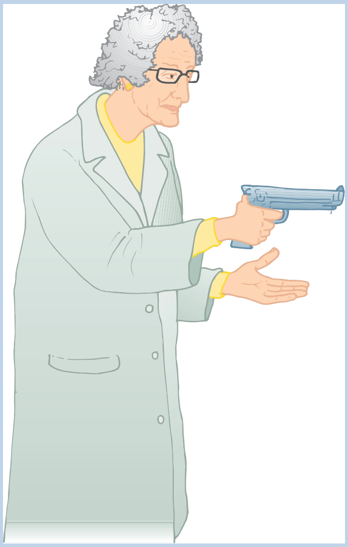


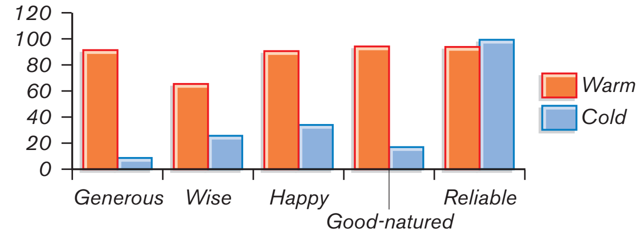
Figure 24.1(b) Now what are they?

behaviour also differed between conditions. Those in the warm group asked more questions and interacted more with the lecturer than those in the cold group. Impressions seem to influence how we behave.

The conclusion we can draw from both Asch’s and Kelley’s work is that impressions seem to be generated by the integration of wholes based on specific and central cues. When at least two traits are thought of as belonging to a person, the traits no longer exist in isolation from each other but combine to form the whole impression (Asch, 1946). This idea has been encompassed into implicit personality theory (Bruner and Tagiuri, 1954), which argues that people have preconceptions of what a person is broadly like based on knowledge about central traits.

Other work has criticised Asch’s approach as being far too simplistic and has stated that the centrality of any trait

(a) Central traits



(b) Peripheral traits

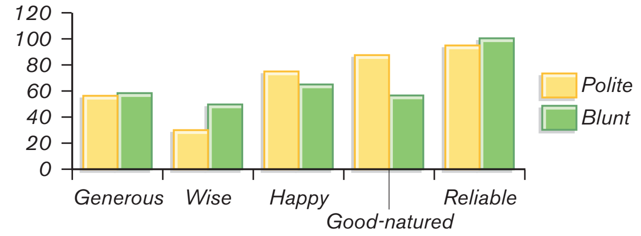


Figure 24.2 Percentage of participants' agreement with other traits based on central and peripheral traits
Source: Asch (1946)

is dependent on the context in which the impression is being formed (Rosenberg *et al.*, 1968). The idea is that Asch's results can be explained because the central traits (e.g. warm, cold) contrasted with other cues and were also linked semantically with evaluative dimensions (we can see this from Table 24.1).

Rosenberg and colleagues proposed that in different contexts we use two evaluative dimensions, good/bad in intellectual terms and good/bad in social terms. Applying this to Asch's stimuli, warm/cold is good/bad in social terms as are the traits used by the participants to evaluate the imaginary person. The other traits (e.g. intelligent, skilful) are good/bad in intellectual terms. It is not surprising, therefore, that the warm/cold conditions showed an effect and the polite/blunt ones did not.

Self-test: How do central and peripheral traits differ?

Primacy and recency effects

We have all heard the adage 'first impressions count'. Is this the case, though? Is there a bias towards the first things we hear, read or observe in another person (primacy effect) or a bias towards the latest information we get (recency effect)?

By presenting two lists of words that were identical except that one list had the words in the reverse order to the other (see Table 24.2), Asch (1946) demonstrated a primacy effect. He showed that earlier traits had the greatest influence on the impression formed. So, being presented with List A produced a more favourable impression and List B a more unfavourable impression. Asch argued that first information affects the meaning of later information.

It is not uncommon to change the meaning of information received later in light of what you were told first about a person. This suggests that early information may act in much the same way as central cues. People naturally seem to pay more attention to facts presented first (primacy) and pay less attention to later information. This shift in attention is most apparent when we are presented first with negative facts about a person (Fiske, 1980) and we will form an impression based on that.

Self-test: Outline Solomon Asch's trait reversal experiment.

Why should this be? Well, the person-positivity bias argues that we seem to assume that people are good (Sears, 1983), so if negative information is seen or heard it tends to grab our attention (Peeters and Czapinski, 1990; Skowronski and Carlston, 1989).

This primacy effect was replicated by Luchins (1957), who also provided evidence of conditions under which a recency effect may be evident. He presented participants with a description of a man called Jim. One of these gave the description of Jim's behaviour as being extroverted, the other as being introverted. Participants were randomly assigned to four different groups based on the order in which they received introversion and extroversion information. Research methods box 24.1 shows the four groups.

Impression ratings of Jim's introversion and extroversion showed the predicted difference between groups 3 and 4. Those who got the extroversion information before the introversion account (group 3) viewed Jim as more extroverted than those who received the reverse order (group 4); this is known as the primacy effect. Luchins explained the effect by suggesting that when people are given information that contrasts with what they already have about a person, they treat the information they received first as indicative of what that person is 'really like'.

Luchins also showed that after a delay between getting information about a person and actually being asked to form the impression, people were more likely to make recency judgements. Also, if motivated to attend to later information (like asking the person not to make any immediate impression) they would base their impressions on the most recent information. He also showed that the recency effect is used more when we are forming impressions of people we know. When we learn something about someone after having already formed an impression (recency effect), we sometimes adjust the impression we have of that person (have another look at Figure 24.1!). Although it seems that the primacy effect is more common than the recency effect, and that first impressions do count, it also looks like there may be limits to the primacy effect (Jones et al., 1972).

Self-test: What are primacy and recency effects in impression formation?

TABLE 24.2 WORD LISTS IN ASCH'S TRAIT REVERSAL EXPERIMENT TO ASSESS PRIMACY AND RECENCY EFFECTS

List A	List B
INTELLIGENT	ENVIOUS
INDUSTRIOUS	STUBBORN
IMPULSIVE	CRITICAL
CRITICAL	IMPULSIVE
STUBBORN	INDUSTRIOUS
ENVIOUS	INTELLIGENT

Other factors have also been shown to be important in impression formation. Two examples here are stereotypes and physical appearance. Stereotypes are widely held assumptions about the attributes, attitudes, behaviours and personalities of other people, based on group membership (see Chapter 21 for more information on this).

When we come across a person for the first time we usually categorise them by how they look and behave and form an initial judgement or impression of them based on these stereotypes. We also seem to form impressions based on physical appearance. Ever remember complaining to your mother or father about having to wear your 'best clothes' when visiting relatives and asking them why you have to dress up like that? The response was probably the same for many of us: 'Because you want to make a good impression.'

RESEARCH METHODS BOX 24.1

Luchins' four experimental groups for impression formation of a character called Jim

Story	Description
Group 1	Read Jim the extrovert description
Group 2	Read Jim the introvert description
Group 3	Read Jim the extrovert description first and then Jim the introvert description
Group 4	Read Jim the introvert description first and then Jim the extrovert description

Note: groups 1 and 2 are control groups. People were assigned to these conditions to rule out the idea that any effects are due to people being able or unable to identify introvert and extrovert traits. Obviously people in group 1 rated Jim as the most extroverted and those in group 2 rated him as the most introverted.

Evidence shows that because the physical appearance of a person is usually the first thing that we encounter it may have a dramatic effect on the impression we form (see the section on attraction later in this chapter). For instance, attractive male professionals were rated as more able than unattractive ones (Heilman and Stopeck, 1985). Attractiveness is also related to the impression of being a 'good' person (Dion et al., 1972).

Self-test: How is physical appearance important in impression formation?

The assumption we made at the beginning of this chapter is that we all form impressions when presented with information about people from our environment (Hastie and Park, 1986). The work we have looked at so far basically shows that when people are asked to form impressions they do so in quite predictable ways. This may well be correct but what this work does not tell us is at what cognitive level these impression formation goals operate.

Level of processing in impression formation

Do we have to be aware that we are making an impression for us actually to do so? Does having an impression formation goal predict actually forming the impression? When we see a person behaving in a way that is clearly linked to a trait stored in our memory (e.g. a person punching somebody else is indicative of them being 'angry', 'frustrated') it activates the trait concept regardless of whether you want to form an impression or not (see Bargh, 1997; Bargh and Pietromonaco, 1982).

It is argued that traits such as honesty, aggressiveness, intelligence and so on, when repeatedly paired with behaviour that we see as fitting them, can eventually become activated automatically by the mere presence of the behaviour. So, for example, over time we have learnt that seeing a person being violent will automatically evoke a view that they are the angry 'type' or the frustrated 'type'.

One study showed that by getting people to form sentences from a set of scrambled (jumbled-up) words (e.g. 'he fell her kicked'), people were likely to form an impression of another person that was in line with a hostility trait (Srull and Wyer, 1979). The idea is that the hostility trait has become accessible in a person's memory because unscrambling the sentences has triggered the stored representation of the trait and also its association with the behaviour in a person's mind. This was the case even though participants had not been instructed or told that they would be forming an impression until after the so-called 'language test'.

Similarly, John Bargh and others have also shown that impression formation goals – motivating an individual to form an impression of another person – can also be kicked into action implicitly, when a person is not consciously aware that they are forming an impression. Chartrand and Bargh (1996) used scrambled sentences and also what is called subliminal priming to activate the impression formation goal (see Research methods box 24.2 for a description of scrambled sentence and subliminal priming techniques). They found that people who were primed with impression formation goal words were more likely to go on to form impressions of other target individuals.

So, we've now got some idea of how we form impressions of other people and, of course, we also know that other people form impressions and then change or update them about us. Because we all want to be in control of how other people see us and think about us, we are also in the game of trying to *manage* the impressions these people have of us. How do we do this?

Self-test: Describe two types of priming.

Impression management

People behave differently in public from how they do in private (Leary, 1995). They seem to take on different roles when their audience changes, just as actors do in the theatre. What types of motive are there to explain this? Snyder (1974) demonstrated that people who self-monitor, or those who are careful about how they present themselves, adopt strategic self-presentation tactics, while low self-monitors apply expressive self-presentation strategies. The adoption of these strategies may have the effect of guiding the impressions others make of us as a result of social interaction.

Strategic self-presentation is about changing or managing others' perceptions of you. The motives we have for self-presentation are (Jones and Pittman, 1982; Leary, 1995):

- ingratiation (trying to get others to like you)
- self-promotion (trying to persuade others that you are a competent person)
- intimidation (trying to get others to think you are dangerous)
- supplication (trying to get others to think of you as helpless and take pity on you)
- exemplification (trying to get others to think of you as morally respected and someone to be trusted).

If you think about it, you should be able to recall occasions when you have used one or all of these strategies.

Self-test: List three motives for strategic self-presentation.

Expressive self-presentation is about people trying to get some validation of their self-concept through their behaviours. For instance, we might try to reinforce the idea we have of ourselves that we are selfless by always agreeing to help other people. However, the self-concept we have is irrelevant, and does nothing for our self-esteem if others do not reinforce or even recognise it (Swann et al., 1992). What is the point of having the idea that you are selfless if everyone thinks you are selfish?

This idea that we use self-presentation to define our self-concept has been shown in work on delinquency. For instance, Emler and Reicher (1995) argue that delinquency is always performed publicly so that others can validate it and recognise it as part of a person's makeup, thus reinforcing the delinquent self-concept. Other work has shown that when asked about which behaviours are important to their self-concept, people invariably report publicly performed ones (Tice, 1992). (Take a look at Class activity box 24.2.)

Social interaction, nonverbal communication and behaviour

Having looked at how impressions are formed and the motives behind how we manage these impressions, we now turn to social interaction. The way we interact with people is of course central to how we communicate our thoughts, feelings, motives, goals, intentions, beliefs, desires and so on to others. Interaction is the main vehicle for expressing ourselves to others and also allows us to understand and make sense of the beliefs and behaviours of others in our environment. Social interaction is basically a form of communication and for human beings communication can be verbal or nonverbal. As such, communication depends on a common understanding of what words, sounds and gestures mean.

The cognition underlying language and how language develops have already been covered in Chapters 15 and 19 respectively. Here we will concentrate on nonverbal communication and behaviour, and also cover attraction, aggression and pro-social (e.g. helping) behaviour. All of these are examples of behaviours that reflect social interaction and interpersonal relationships.

Nonverbal communication

Speech allows us to convey things to people in our immediate social environment and provides meaning for interactions. Searle (1979) has identified five types of

RESEARCH METHODS BOX 24.2

Scrambled sentence and subliminal priming techniques used in social psychology

These techniques allow the researcher to look at how a concept or representation of an environmental event we have in our memory leads to the types of impression we form, the types of attitude we display, and the types of behaviour we emit. The idea is that priming activates the representation we have of an event automatically, or without our conscious control. We are not aware that we are necessarily thinking in the ways we do.

Let's take an example here to make things a little easier. What about driving a car? Initially when you are learning to drive you 'think' the whole time about the environmental events going on around you. You also have to think about when to change gear, when to put your foot on the accelerator, the brake and the clutch, and so on and so forth. Over time, however, these behaviours all become habitual. In other words, you no longer consciously 'think' about how to drive – it just happens. This is an example of a behaviour becoming automatic in the presence of environmental events – in this case events encountered while driving.

Scrambled sentence priming and subliminal priming techniques are particularly useful because they are designed to study how events are interpreted and acted upon in this non-conscious way (see Bargh and Chartrand, 2000, for a description of these techniques, with examples).

Scrambled sentence priming

For this technique participants are initially told that the task is about language ability. They are instructed to make sentences from a number of strings of words. In an experiment looking at the effects of priming the old age stereotype on subsequent behaviour, Bargh, Chen and Burrows (1996) used 30 scrambled sentences to activate the old age stereotype, including:

1 should now withdraw forgetful we
2 sunlight makes temperature wrinkle raisins
3 shoes give replace old the
4 the push wash frequently clothes
5 they obedient him often meet

In the course of doing this task the participant is exposed to some concepts the experimenter wishes to prime, sentences 1, 2 and 3 above (the concepts are not italicised in the actual priming task but are italicised here for easy identification), and to other concepts that are not related to the concept, sentences 3 and 4. Sentences are usually randomly presented.

The participant is then required to do some other task. For example, in the example above, participants for whom an elderly stereotype was primed walked more slowly down the hallway when leaving the experiment than did control participants, consistent with the content of that stereotype.

To make sure that the people are not aware that there is a link between the scrambled sentence priming and measured task (e.g. how quickly someone walks) participants are asked a number of questions, including 'Did you think that any of the tasks you did were related in any way?' and 'When you were completing the scrambled test, did you notice anything unusual about the words?' This is called the funnelled debriefing procedure. Any participant who gives replies which indicate that they are aware of the purposes of the experiment or have made a link between the scrambled sentences and the test phase are not used in any subsequent analysis.

Subliminal priming

Ever been the subject of a subliminal message? You wouldn't know if you had! This type of priming gets over the need to question participants about whether they make the link between the priming phase and test phase of an experiment. How? Well, the most basic form of subliminal priming presents words related to the concept to be primed (e.g. 'old' and 'wrinkled' for the old age stereotype) very rapidly on a computer screen. The presentation is so rapid that the person sees only a flash at best; they cannot see the word itself. (Images are sometimes used with this technique too.)

In other words, the prime is presented below the visual recognition threshold. In this case the participant is primed without their being consciously aware that this is happening because the prime does not register at all in conscious thought (see Chartrand and Bargh, 1996).

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meaning that people use language to communicate. These are:

1 to describe how something is
2 to express feelings and attitudes
3 to get someone to do something
4 to make a commitment
5 to accomplish something directly.

For some psychologists, language or discourse tells us a lot about how people operate in their social worlds (Potter, 1996; Potter and Wetherell, 1987).

However, speech rarely happens in isolation from other nonverbal signs. Gestures, facial expressions, postures and even the distance we put between another person and ourselves are all examples of nonverbal cues (Argyle, 1988; DePaulo and Friedman, 1998). For example, people who are

CLASS ACTIVITY BOX 24.1

Impression management in interviews

Let's face it, at some point in your lives (if you haven't already) you are going to be in a position in which you have applied for a job and have been invited to interview. In this exercise, we are going to role play how people attempt to manipulate the impressions other people have of them. In other words, we are going to take a look at the types of strategy that people use to manage others' impressions of them.

Before doing anything, read the relevant sections on impression management and also nonverbal communication in the book. Then get into small groups (say four or five of you). Assign one person the role of applicant for a hypothetical job, one person as an observer and the remainder of the group as interviewers. The task is simple. Hold a mock interview that lasts a maximum of 10 minutes. The interviewee is asked to use some of the impression management strategies to influence the impressions formed by the interview panel. Ask yourselves the following questions: How do you get the interview panel to ingratiate themselves to you? In this situation would it be advisable to use a supplication tactic? What kinds of nonverbal cues are you going to use in the course of the interview? The role of the observer is to make notes on the possible tactics being used by the interviewee.

After the role play have a discussion to identify the tactics being used guided by the notes made by the observer. Would other members of the group have used different strategies? If so, why? Are some tactics more context specific than others? How effective were the strategies used – would the interviewee be offered the job?

answers at the end of the section

telling a lie tend to put their hands to their faces or fiddle with their fingers (DePaulo, 1994).

People acquire the use of nonverbal cues very early in life. Most of the time we don't know we are using them, they just happen automatically, like smiling to convey being happy or grimacing to show disapproval (Erickson and Schulkin, 2003). On other occasions, these cues are used deliberately, just as the person in Photo 24.2 is doing.

Photo 24.1 Would you employ this person?

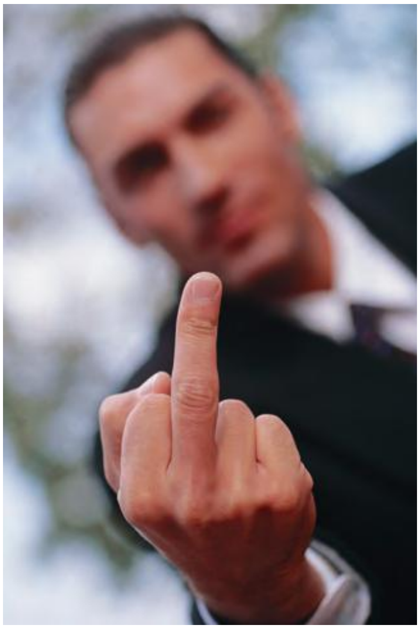

Photo 24.2 What is this person trying to 'say'?

Patterson (1983) points to five reasons why we use nonverbal communication in our social interaction:

1. to give out information about how we are feeling and what our intentions are – we use cues to show other people whether we like them or not and also interpret others' nonverbal cues to decipher whether or not they like us
2. to direct the social interaction – for instance, nonverbal cues are used as signals in turn taking (showing a person that it is their turn to speak)
3. to express intimacy with another through touching or forms of eye contact
4. to help attain a goal, like pointing at something you desire
5. to give out information about your desire to be the dominant one in a social interaction by the use of nonverbal threats.

One form of nonverbal communication that does not involve explicit parts of the body – like the hands, the face or the eyes – to convey information is *interpersonal distance* (also called proxemics). You have probably all heard the expression 'don't invade my personal space'. This expression is really saying that a person is getting too close and that you feel threatened by them in some way; this is because interpersonal distance is used to convey intimacy, liking or privacy (Hayduk, 1983). The further away you are, the easier it is to disguise the nonverbal cues you are giving

FOCUS POINT 24.1

Hall's (1966) interpersonal distance zones: 'How close is close enough?'

Intimate distance

Your proximity to the other person is anywhere up to about 0.5 metres away. A lot is exposed about a person in this zone. The cues you get about another person in this zone include smell, how heavily they are breathing, body temperature and other visual cues. In this zone there may well be some touching.

Personal distance

This ranges between 0.5 and 1.25 metres and is thought of as the transitional region between intimate contact and more formal contact. It is characteristic of our interactions with friends and other close acquaintances. At this distance many cues are still available, including touching, although other more intimate cues are not as strong.

Social distance

This ranges from 1.25 to 4 metres. It is the distance we usually put between ourselves and other people we are having a casual interaction with. It is also characteristic of the normal business meeting arrangement. Furniture is set up so that the distance between you and the other person is across a table. Many cues are available, and of course speech is still there too.

Public distance

This is characteristic of very formal communication occasions like speeches and lectures. The distance ranges from about 4 to about 8 metres. In these types of situation communication is usually unwanted and the distance between perceiver and communicator conveys this.

off and the other person in the interaction will be less able to use your nonverbal cues to understand your intentions. The opposite, of course, is the case the closer you are (Kahn and McGaughey, 1977).

One classic study showed that when asked to convey either friendliness or unfriendliness to another, those participants who were asked to show unfriendliness placed their chair significantly further away from the other person (Rosenfeld, 1965). From thousands of observations, Hall (1966) identified four interpersonal distance zones that describe the function of nonverbal communication in social interaction. These are shown in Focus point 24.1.

Attraction, liking and loving

We have just noted that more positive impressions are formed of physically attractive people. In terms of faces, some have argued that we are attracted to 'averageness' (see Bruce and Young, 1998). Other work has shown that we experience attraction to others who are similar to ourselves. For instance, people seek out and associate themselves with those who hold similar attitudes to them (Tesser, 1993) (see Chapter 22). Accordingly, opposites do not attract. So why is it that we choose certain people to have a liking or loving relationship with?

Various theories have been developed to answer these questions. The reinforcement-affect model says that people learn to associate particular feelings (liking, loving, hating, etc.) with particular people. They come to do this because of the pairing of the presence of a person with either environmental rewards or punishments that come in the form of emotions (Byrne and Glore, 1970).

The attraction-similarity hypothesis states that in relationships attraction between individuals results in perceptions that are consistent with a similarity explanation. For instance, Morry (2005) showed that in friendships that were rated as being satisfying people reported similarity in the traits and behaviours of themselves and the other person.

Social exchange theory proposes that people like or dislike others in terms of the rewards they exchange between each other (Berg and McQuinn, 1986; Sprecher, 1998). Their liking or disliking is dependent on what is called the cost–reward ratio. This suggests that we all undergo an appraisal of what it will cost to seek reward from another. If the costs outweigh the rewards then the relationship will not work.

Surely, though, the rewards we seek and the costs we try to avoid have to differ across individuals? Yes, they do. Everyone entering a relationship brings with them different expectations about what they should receive from the other person. This is called the *comparison level*. For instance, if you have just come out of an abusive relationship you may think that a relationship without abuse is highly profitable.

Factors shown to be important for influencing levels of reward, and hence attractiveness or liking of another, include familiarity, exposure and proximity. Familiarity suggests that the more we are exposed to another person, the more we like them, even strangers (Moreland and

FOCUS POINT 24.2

The mere exposure effect

Familiarity does not breed contempt! Many studies over the years have shown that the more you are exposed to all kinds of things, the more you like them or rate them more favourably. The graph in Figure 24.3 illustrates this idea. This effect has been shown for our liking of nonsense words (i.e. those that mean nothing), music, faces and so on. We also seem to prefer letters that appear in our own names or that occur frequently in our own languages (Kitayama and Karasawa, 1997).

Furthermore, Zajonc's work has demonstrated that exposure leads to liking even when you do not know that you have been exposed (e.g. Kunst-Wilson and Zajonc, 1980). Can you think of ever immediately liking or disliking something or someone without knowing why? This shows that exposure can have its effects at an unconscious level (Zajonc, 1998).

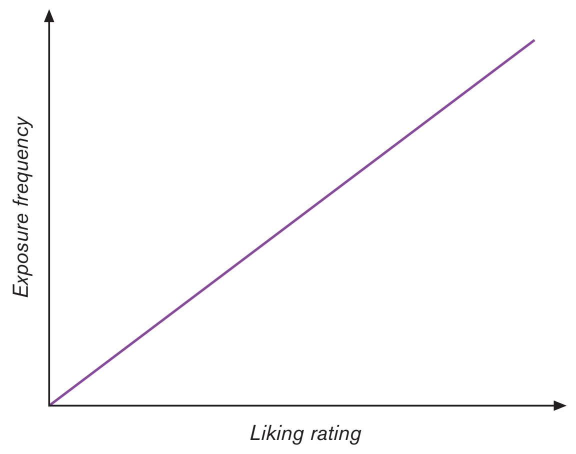

Figure 24.3 The mere exposure effect

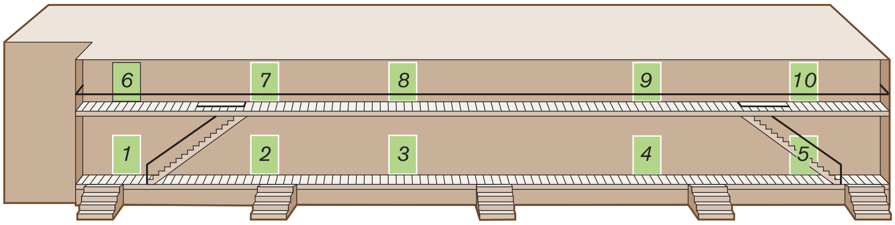

Figure 24.4 Festinger's housing complex study
Source: Festinger, 1950

Zajonc, 1982). This is called the mere exposure effect (see Focus point 24.2). For example, Moreland and Beach (1992) showed that students rated as most likeable those lecturers they had contact with most often.

Self-test: What is the mere exposure effect?

Proximity has also been shown to be important for relationship development (Kahn and McGaughey, 1977). Living close to another person increases the chances that you are more likely to enter a relationship with them than if you live further apart. A classic study showed the effect of proximity on entering friendships (Festinger, 1950) (see Figure 24.4). Proximity may be important because the nearer you are to a person, the greater the likelihood of exposure, repeated exposure and, of course, familiarity.

Look at Figure 24.4. Compared with other residents on the ground floor, people who lived in flats 1 and 5 interacted most with residents who lived on the upper floor. Why? Because flats 1 and 5 are near communal staircases, which the other residents have to use to go in and out of their homes. The probability of encountering the first-floor residents is greater, then, for those who live next to a shared space. Also, Festinger found that more friendships were seen between flats 1 and 6 than between 2 and 7. The same was the case for flats 5 and 10 than between flats 4 and 9.

Based on the core assumptions of social exchange theory, equity theory suggests that, along with a cost–reward analysis, liking is dependent on how fair people think the exchange is (Adams, 1965). For example, have you ever been in the situation where you think that you put an awful lot into a relationship but receive very little in return? This is an example of inequity.

Consider the relationship between two people, Henry and Beth. Equity exists between these people when the ratio between the outcomes of a relationship and the inputs into the relationship for both Henry and Beth are equal. If inequity occurs then one or other of the individuals will alter their perceived inputs to, or outcomes from, the relationship so as to maintain a balance (see Figure 24.5).

Thus far we have really just looked at some of the evidence that shows why people become attractive and why we like some people and not others. Other psychologists have been addressing the question of whether loving someone is different from liking someone (Dion and Dion, 1996). The lay perception is that it is.

Rubin (1973) believed that liking is completely distinct from loving and suggested that loving comprises attachment, caring and intimacy. Also, Lamm and Weismann (1997) have suggested that 'liking' is about wanting to interact with a person, 'loving' about trusting a person and 'being in love' about being aroused by another person.

In his triangular model of love, Sternberg (1988a) proposed three aspects of love: intimacy (e.g. feelings of closeness), commitment (e.g. the decision to be fully in the relationship) and passion (e.g. sexual desire). Look at Figure 24.6. The three components of love form the three points on the triangle. If a relationship has only the passion component the relationship is described in terms of infatuation (the external points on the diagram). If there are two dimensions, like passion and intimacy, the type of relationship is seen by reading the appropriate diagonal that links the dimensions, in this case, romantic love. Having intimacy, passion and commitment is called consummate love (the circle in the middle of the triangle).

Pro-social behaviour

Pro-social behaviour refers to acts that are evaluated positively by your society, those that contribute to the psychological and physical well-being of others (see Dovidio and Penner, 2003; Eisenberg *et al*., 1996). Firefighters and paramedics indulge in pro-social behaviour. These behaviours include helping, altruism, cooperating, comforting and bystander intervention (Batson, 1998). Simple examples here are helping an old person across the road or diving into a swimming pool to assist a person who is obviously drowning.

We have already seen, in Chapter 23 (on attribution), that the just world hypothesis predicts that we have a tendency to believe that people get what they deserve (Lerner and Miller, 1978). If people deserve bad things to happen to them, why help them? In this section we are going to focus on altruism and bystander intervention as examples of pro-social behaviour and ask the question: 'Why do people decide to help?'

Altruism

Altruism is a special form of helping behaviour. It describes those behaviours that are acted out without any expectation that you will be rewarded for them. Do we ever perform behaviours that will not result in some form of reward (or punishment)? We may not get immediate external feedback, but surely we know that helping will make us feel good and bolster our self-worth.

This debate was taken up by social psychologists studying empathy. Empathy is the ability to experience the emotions that somebody else is experiencing. Some have argued that only behaviour associated with empathy feelings is truly altruistic – this is Batson's empathy–altruism hypothesis (Batson et al., 1981; Batson et al., 1989, 1999). In contrast, Robert Cialdini's (Cialdini et al., 1997; Maner et al., 2002; Schaller and Cialdini, 1988) negative state relief theory argues that we act pro-socially to relieve our own state of distress about another's misfortune. He and his colleagues have shown that willingness to help was predicted not by people's empathy scores for a hypothetical person in need, but by how sad that person's predicament made them feel (Cialdini et al., 1987).

In an ingenious extension to this work, some of the participants were given a so-called 'mood-fixing placebo'. They were told that this pill would make it impossible for them to alter their moods. As a placebo, of course, this was not the case. The results showed that after taking this pill fewer people were willing to help and this included those who scored highly on empathy for the hypothetical person. So it is still not clear whether empathy or relief of distress accounts for altruistic behaviour.

Self-test: List two theories developed to understand altruism.

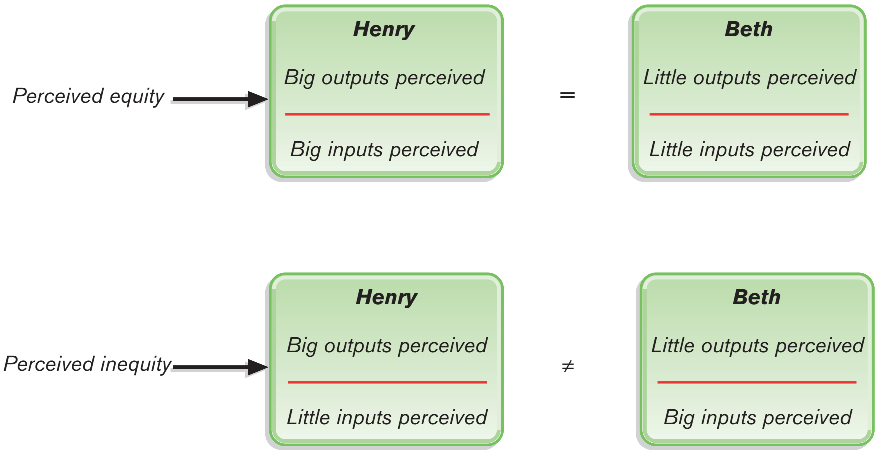

Figure 24.5 Perceived equity and inequity in a personal relationship
Source: adapted from Hogg and Vaughan, 2002

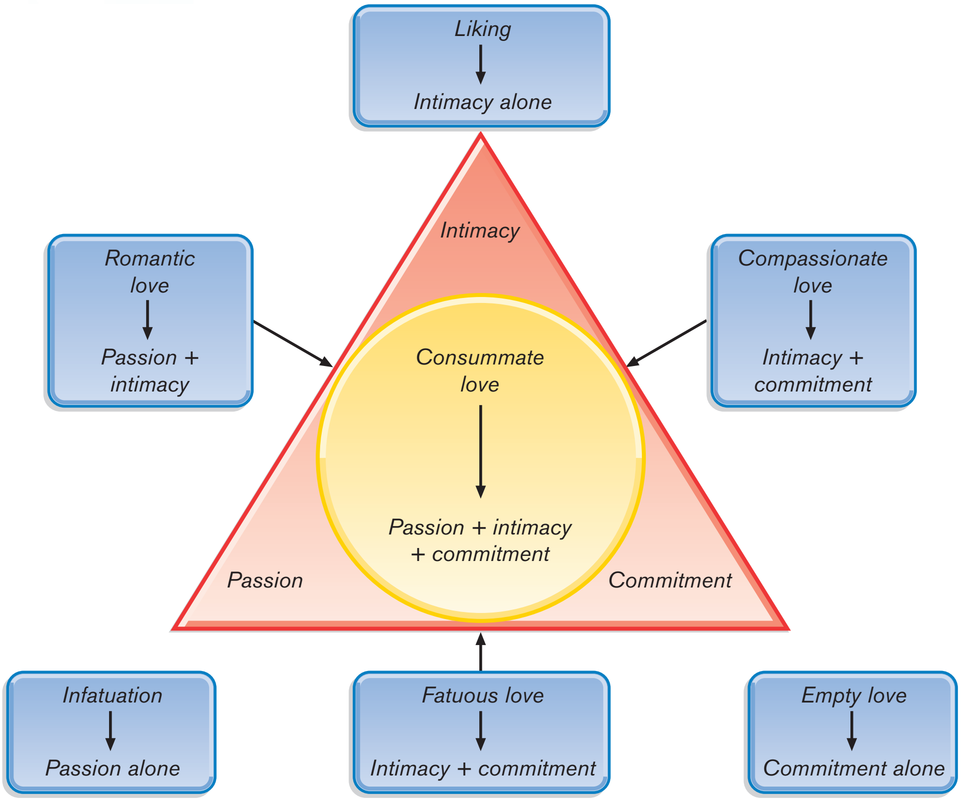

Figure 24.6 The triangular model of love (Sternberg, 1988)
Source: based on Kosslyn and Rosenberg, 2004: 697

Bystander intervention

The infamous case of the murder of Kitty Genovese in 1964 sparked interest in trying to understand factors that are important for helping (or not helping) someone who is in immediate need. Read about the case in Focus point 24.3 and then think about what you might have done in similar circumstances? Would you have helped if nobody else did?

At no point during the attack did the 38 people who witnessed the murder described in Focus point 24.3 try to help. This has become known as the bystander effect. This spurred John Darley and Bob Latané to undertake a programme of work designed to understand why people do not help or act in the presence of others (Latané and Darley, 1968, 1970). Their cognitive model of bystander intervention identified five steps in the decision to help, or not help, when others are present (see Focus point 24.4).

In one of their experiments, Latané and Darley (1970) had students attend an interview to discuss life at their university. While they were filling in a preliminary questionnaire smoke was pumped into the room. Participants were either by themselves, with two research confederates who completely ignored the smoke, or with two other people (non-confederates) who were strangers to them. About 75% of the people who were alone reported the smoke and only about 38% of those in the other two groups did. Why?

Latané and Darley introduced the idea of diffusion of responsibility as an explanation of the bystander effect (Latané, 1981). This is when a person assumes that other people will take responsibility for dealing with an emergency, with the result that nobody does. The same pattern emerged when people were exposed to a situation in which a person was having an epileptic fit. By themselves people helped, but helping behaviour decreased as the number of bystanders increased.

Another explanation is known as pluralistic ignorance. This view argues that individually each person believes that their personal perceptions and feelings are different from other people's, while at the same time their behaviour is the same as everyone else's (i.e. not helping). Because of this co-occurrence, people come to think that other people in the emergency situation believe the event to be harmless and that, therefore, they do not need to do anything about it.

An alternative proposed by Piliavin *et al*. (1981) is called the bystander-calculus model. It proposes a central role for both cognitive determinants and arousal in the bystander effect. It proposes three steps that people proceed through when faced with an emergency involving another person:

1 Physiological arousal: this is the first response and may include things such as faster heartbeat and breathing.
2 Arousal labelling: in this stage the person feels personal

FOCUS POINT 24.3

The murder of Kitty Genovese (adapted from the *New York Times*, 27 March 1964)

The article below was originally reported in the *New York Times* two weeks after the murder of Kitty Genovese. The case spawned a significant amount of research into reasons why people may or may not help others in need.

Thirty-eight who saw murder didn't call the police

by Martin Gansberg

For more than half an hour 38 respectable, law abiding citizens . . . watched a killer stalk and stab a woman in three separate attacks. . . . Twice their chatter and the sudden glow of their bedroom lights interrupted him and frightened him off. Each time he returned, sought her out, and stabbed her again. Not one person telephoned the police during the assault; one witness called after the woman was dead.

Kitty . . . was returning home from her job as a manager in a bar. . . . [S]he parked her red Fiat in a lot . . . turned off the lights, . . . locked the door and started to walk the 100 feet to the entrance of her apartment. . . . Miss Genovese noticed a man at the far end of the lot. . . . She got as far as a street light in front of a bookstore before the man grabbed her. She screamed. Lights went on in the 10-story apartment house. . . . Windows slid open and voices punctuated the early morning stillness.

Miss Genovese screamed: 'Oh, my God, he stabbed me! Please help me! Please help me!' From one of the upper windows in the apartment house, a man called down: 'Let that girl alone!' The assailant looked up at him, shrugged, and walked . . . away. Miss Genovese struggled to her feet.

Lights went out. The killer returned to Miss Genovese. . . . The assailant stabbed her again. 'I'm dying!' she shrieked. 'I'm dying!' Windows were opened again, and the lights went on in many apartments. . . . It was 3:35 a.m. . . . The assailant got in his car and drove away. . . . The assailant returned. . . . He stabbed her a third time – fatally.

It was 3:50 by the time the police received their first call from . . . a neighbour. . . . In two minutes they were at the scene. The neighbour . . . and another woman were the only persons in the street. Nobody else came forward. The man explained that he had called the police after much deliberation. . . . 'I didn't want to get involved,' he sheepishly told police.

[W]itnesses from the neighbourhood . . . find it difficult to explain why they didn't call the police. . . . A man peeked out of a slight opening in the doorway to his apartment and rattled off an account of the killer's second attack. Why hadn't he called the police at the time? 'I was tired,' he said without emotion. 'I went back to bed.'

It was 4:25 a.m. when the ambulance arrived to take the body of Miss Genovese. It drove off. 'Then,' a solemn police detective said, 'the people came out.'

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distress (anxiety and tension) and comes to label their physiological responses as reflecting this.

3 Evaluation of consequences: this suggests that, before acting, people weigh up the costs of acting and the costs of not acting. For instance, if the costs of helping are high (e.g. being attacked by the person mugging somebody else) and the costs of not helping are low (e.g. not feeling that people will blame you for not helping) a person is not likely to help. If, however, the costs of helping are low and the costs of not helping are high, a person is likely to offer direct assistance.

See Chapter 25 for a discussion of other theories and approaches that might be useful in understanding how people behave in the presence of others.

Self-test: What is the bystander effect?

Aggression

We have seen why people are attracted to others and why they like them or love them. At times, however, people are aggressive to others. Aggression refers to behaviour that is intended to harm another person who does not wish to be harmed.

Photo 24.3 Ouch, that really hurt!

FOCUS POINT 24.4

Latané and Darley's cognitive stage model of decision making in emergency situations (based on Latané and Darley, 1970)

Stage 1

Does the bystander notice the event or notice that something is wrong, like an emergency?

Stage 2

Does the bystander interpret the event as one that may require help to be given? Verbal distress cues like screaming are effective in increasing the likelihood of helping.

Stage 3

Does the bystander accept personal responsibility for helping? This decision is influenced by whether there are other onlookers and how competent the bystander feels in a particular situation.

Stage 4

Does the bystander decide what to do in the situation?

Stage 5

Does the bystander decide how to implement what they have decided to do?

If the answers to all of the above questions are 'Yes', then help will be given. If, however, at any stage during the decision-making processes the answer to the question is 'No', help will not be given. So, for example, if we do not think that the event is really an emergency, or we do not really know what to do, it is likely that the behaviour of other people around us will influence our actions (or inaction).

APPLICATIONS BOX 24.1

Road rage in three European countries

Reports in the media seem to suggest that road rage is on the increase. We regularly come across reports about how aggressive people appear to become in reaction to how other people drive. While this behaviour usually involves verbal aggression, at times people have become physically violent towards other drivers and road users.

This sort of behaviour is not restricted to drivers. Some reports have been made about 'office rage', and even 'trolley rage', where people act aggressively when pushing supermarket trolleys. It's virtually laughable, isn't it? Yet it has stirred some recent work.

For instance, Diane Parker and colleagues looked at how angry and aggressive a number of different driving situations make drivers feel. They studied this in three countries: the Netherlands, the UK and Finland (Parker, Lajunen and Summala, 2002). They developed the Driver Anger Questionnaire. Drivers were asked to rate how angry each of 22 driving situations would make them feel. Those situations that made drivers most angry were: when someone cuts in and takes the parking spot you have been waiting for; when at night someone is driving behind you with bright lights on; when someone is driving very close to your rear bumper; when someone speeds up when you try to pass them. I can hear your blood boiling now!

For each of these situations, drivers were also asked how they would react. They were given a number of options, including 'no reaction', 'beep the horn or flash the lights', 'swear at or verbally abuse the other driver' and 'get out of the car, prepared to engage physically with the other road user'. While reports of fighting with the other driver were not common, those situations that produced the greatest amount of anger in the drivers also provoked the more extreme reactions. For instance, it is probably worth remembering that nicking somebody else's parking space could lead to you being on the end of the other driver's unfriendly hand gestures and horn-blowing. You have been warned!

And, surprise surprise, the study also found that males are more likely to be angrier and react more than females. Got the stereotypical angry driver yet?

Every day, through the media, we are bombarded with images and reports of people acting aggressively. Think about 'road rage'. Have you ever been the victim of road rage or even the perpetrator of road rage? It is highly likely that if you drive a car you have. What could explain why people become aggressive – and at times violent – as a result of getting stuck in heavy traffic? (See Applications box 24.1.)

What have social psychologists offered to explain aggressive behaviour? In general they have attempted to understand aggression in terms of learning processes and factors related to the social context of the behaviour – although biosocial approaches have also been proposed. These approaches incorporate the view that social context triggers a basic drive or instinct to be aggressive.

The biosocial approach

One such model is the excitation-transfer approach (Zillmann, 1988). This proposes that aggression is the product of learned behaviour, arousal (or excitation) from another stimulus and the person's interpretation of this aroused state (i.e. aggression is appropriate). The model seems therefore to combine biological, learning-based and cognitive factors for the understanding of aggressive behaviour.

The main premise of the model is that arousal in one context transfers to another. When a second stimulus (or context) is encountered, the already aroused person might interpret it in a way that, for them, requires an aggressive act. One example here could be the verbal and physical violence we see among football fans after a game. Kerr (1994) has noted that after-match violence between fans could be caused by the heightened states of arousal generated while watching the game.

The learning approach

The major proponent of this approach is Albert Bandura, who applied his social learning theory (1977b) to understand aggression. By adopting the principles of reward and punishment from operant conditioning (see Chapter 8), he proposed (Bandura, 1977a, 1973; Skoler, Bandura and Ross, 1994) that a person's aggressive behaviour in a given context is predicted by:

- their previous experience with their own and others' aggressive behaviours
- how successful this aggressive behaviour has been previously
- how likely they think it is that aggressive behaviour in the current context will be rewarded or punished
- the effects of environmental factors within the current context.

Bandura also proposed that modelling is the key vehicle through which learning occurs. Modelling is a form of observational learning in which people reproduce the attitudes, beliefs and behaviours displayed by another person. It was demonstrated in the classic bobo doll experiment (Bandura *et al.*, 1963) (see Chapter 17 and Photo 17.1).

In this study 4- and 5-year-old children were randomly assigned to one of four aggressive behaviour conditions, as follows.

1. The live condition: an adult came into the room, played for a bit with the child and then started to behave aggressively towards the bobo doll.
2. The video condition: this was exactly the same as the first condition except that the child watched the adult's behaviour on video.
3. The cartoon condition: the bobo doll itself acted in the same way as in the first two conditions except that it was dressed in a catsuit.
4. A control condition: the child was just allowed to play with the doll.

The dependent measure was the number of aggressive acts the child made towards the bobo doll when left alone to play with it. Children exposed to any aggressive acts by adults towards the bobo doll also behaved aggressively towards the poor thing when left alone to play with it.

Importantly, this study showed modelling of behaviour when the child was exposed to a real person and also when the child watched television images.

Bandura's experiment fostered much research into the role of learning in aggressive behaviour. For example, it has been applied to the possible role of the media (e.g. violent TV programmes) in promoting future aggressive behaviour (see Freedman, 2003), and to investigating whether smacking a child leads to increased aggressive behaviour in the child (Strauss *et al.*, 1997).

Self-test: What is modelling?

In this chapter, you have been presented with some of the theories and evidence that social psychologists have used to study impression formation and social perception. Specifically, we looked at how we form impressions of others (and manage these impressions), nonverbal communication strategies in interpersonal or social perception and what we can say about why people like and love others, why they are aggressive to others and why they may help others in particular situations.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the key factors involved in forming impressions of others.
2. Evaluate theories and evidence that have been used to understand impression formation processes.
3. Describe strategies people use in managing the impressions of others.
4. Describe the role of language in social interaction and communication.
5. Describe the role of nonverbal cues in social interaction and communication.
6. Discuss theories and evidence that ask the question: 'Why are we attracted to some people and not others?'
7. Discuss ideas that have been proposed to explain aggressive behaviour.
8. Critically assess evidence and theory that have looked at why people help others in need.

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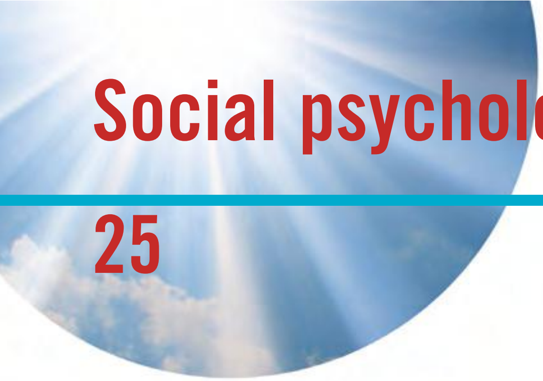


Social psychology

25

Social influence and group processes

Route map

This chapter provides an introduction to some of the theories and evidence that social psychologists have used to study social influence and other group processes. We begin by identifying different types of group and then move on to research that has been used to understand how groups can influence people to change their attitudes, beliefs and behaviours. The second part of the chapter looks at work on how a person's performance can be influenced by other people watching them. The third part looks at group decision making, group performance and what happens when poor decisions are made. We then turn to conditions when people behave in ways they normally would not. For instance, we will look at the conditions under which people obey authority. The role of leaders will also be discussed in terms of group performance. Finally, we study how groups behave towards one another, with special reference to conflict and discriminatory behaviour.

Introduction

Groups are made up of two or more people. According to Rupert Brown, 'a group exists when two or more people define themselves as members of it and when its existence is recognised by at least one other' (2000b: 3). So you may be a member of a group of people who like watching soap operas on television. Within that, you may be a member of a group of people who particularly like *EastEnders* over the other soaps. You are also likely to be a member of a group of people who are studying or are interested in psychology. Try to think of the groups you are a member of. The list could go on for ever.

It should be clear by now that we are all members of groups. One important characteristic of the term group that is drawn out in Brown's definition is that the group should be known to others. These 'others' are people who do not define themselves as members of the group. For instance, the *EastEnders* group is a group because people who do not like watching soaps or who prefer *Coronation Street* recognise that there are people out there who do like *EastEnders*.

Groups are important because, as we shall see, membership can define who we as individuals think we are. Groups are also important because group membership (even artificially produced groups of strangers) can lead to changes in our own beliefs, attitudes and behaviours. This means that groups are important vehicles for how social influence works.

Other factors may also be important in guiding how we behave around others. These include obedience and the role of the group leader. In addition, because a lot of decision making occurs in groups, it is important to understand how and why these decisions differ from those we would make as individuals. Take, for example, the case of juries in criminal trials. Could it be that the decision the jury makes differs from the decisions each jury member would make if left to their own devices?

Understanding group processes is also important because there are occasions when different groups do not get on. In other words, there is intergroup conflict. In our newspapers, on television and on radio we see examples of this all the time. Examples include conflict between union members and employers, violence between football supporters, racial tensions and so on. The sad thing about this is that at one point or another we have all been a member of a group that has been in conflict with another group, however trivial the issue over which the conflict erupted. This chapter will look at all these issues and focus on the following questions:

1. What types of group are there?
2. How are people's beliefs, attitudes and behaviours influenced by others?
3. How do people behave when in the presence of others? Does performance get better or worse?
4. Do group decisions differ from the decisions we would make as individuals? Are two heads better than one?

5 Why are these decisions different?
6 Why do we obey authority figures?
7 What is the role of the leader in groups? Is group behaviour dependent on the type of leader the group has?
8 What gives rise to intergroup conflict and how can we reduce it?

Types of group

Kelley (1952) proposed two types of group. One he called reference groups, the other membership groups. Reference groups are those that are significant for our personal beliefs, attitudes and behaviour. A person may try to behave in line with the norms of the group or against the norms. In other words, reference groups can be significant for us in either a positive or negative way. Membership groups are those that we are a member of for some objective reason (e.g. because you are the prime minister). Your reference groups can also be your membership groups. For instance, for Tony Blair, the Labour Party or even the cabinet are both reference and membership groups.

Stainton Rogers (2003) proposes three types of group: incidental groups, membership groups and identity-reference groups. The last two are really the same as Kelley's. Incidental groups are transient in nature. People in these groups have minimal commitment and involvement with each other (e.g. perhaps you have been randomly assigned to a small group by a lecturer to do one particular exercise). Membership groups are those defined by being a member. People are committed to the group's norms and values (e.g. membership of committees, clubs etc.). Identity-reference groups are those where belonging to the group has an effect on one's social identity. This means that these groups act as a reference frame for a person knowing and understanding who they are. These groups involve identification with the opinions, goal and motives of the group.

The best way to think about the differences between these groups is in terms of commitment and cohesiveness. As we move from incidental via membership to identity reference your commitment to the group will increase. Also, identity-reference groups will tend to be more cohesive (i.e. people act as a group) than, say, incidental groups, where people will act in a more individualistic way. Again for many people these distinctions are not always clear cut.

Self-test: What are reference and membership groups?

Social influence

Social influence refers to ways in which a person's thoughts, feelings and the ways in which they behave are influenced by other people or groups (Lord *et al.*, 2003). You've probably at some time or another been in a situation where you have agreed with other people's opinions and have complied with their requests publicly but have not changed your 'real' internal opinions, which may be different. This is called compliance. On other occasions, you've probably changed these innermost thoughts and feelings as a result of less direct pressure from other individuals or groups. This is called conformity.

Power and influence

For compliance to operate, a person needs to think of the source of influence as being powerful. According to Hogg and Vaughan (2002), power is the ability to exert influence over another person and not be influenced themselves. Raven (1965) identified six sources of power perceived by the person doing the influencing or the person being

TABLE 25.1 RAVEN'S SOURCES OF POWER

Reward power	The ability to promise rewards for being compliant
Coercive power	The ability to give or to threaten punishment for not being compliant
Informational power	The belief of the person being influenced that the person doing the influencing has more information than themselves
Expert power	The belief of the person being influenced that the person doing the influencing has greater expertise and knowledge than themselves
Legitimate power	The belief of the person being influenced that the person doing the influencing is authorised by a recognised power to command and make decisions
Referent power	The person being influenced identifies with, is attracted to or has respect for the person doing the influencing

Source: based on Hogg and Vaughan, 2002

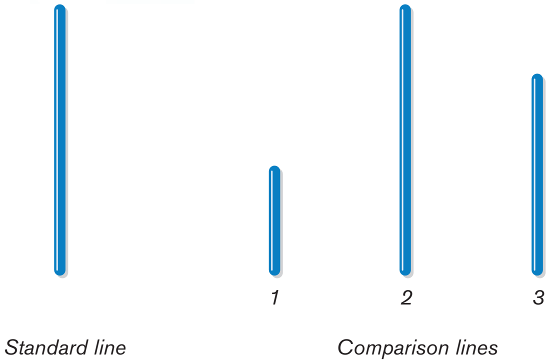


Figure 25.1 Asch's line-judgement task to study conformity

influenced. These are reward power, coercive power, informational power, expert power, legitimate power and referent power (see Table 25.1). For example, obedience can best be thought of as being to some extent dependent on legitimate power and conformity on referent power. Sources of power may all be operating together in the social influence process.

Conformity or majority influence

Majority influence is when social influence occurs after a person has been exposed to the opinions, beliefs or behaviours of the majority of people in a group of which they are a member (see Martin and Hewstone, 2003). Work in this area has investigated whether people change their opinions after learning what the majority thinks. Is this change only there when they give overt responses – out loud in front of others – but not when they respond in private – so that nobody else knows their answers? Under what conditions do people resist conformity pressure?

Self-test: What is another word for majority influence?

Sherif's autokinetic effect experiment

When in a totally darkened environment, people often perceive a small stationary bright light as moving. This is an example of the autokinetic effect. Sherif (1935) used this effect to explore majority group influence. He asked participants to give an estimate of how much the light moved when viewed by themselves and then in groups of two or three. He found that when participants were by themselves, they gave estimates that revolved around their own established reference (personal norm).

When participants were brought together into groups of people with varying personal norms, their judgements appeared to converge towards a common position or group norm. So, for an unstructured and ambiguous stimulus these people appeared to disregard their own reference points in favour of that of the group. Sherif also showed that when people were asked to judge the movement of the light first in groups and then by themselves (the reverse of the first condition), there was no difference between the alone and groups conditions.

In other words, the group norm had already been established and carried over for their responses when by themselves. The effect occurs at the group level and social influence seems to carry on even after the source of influence has been removed. Sherif showed how powerful group norms are in social influence.

Strictly speaking, Sherif's experiment is not a majority group influence experiment, because he had people form groups who all held different beliefs. To demonstrate majority influence we need evidence that a person will change their opinions when in the presence of a *majority* of others who unanimously agree on a response. Solomon Asch did just this – but he was also interested to see whether majority pressure occurs for an unambiguous task when there is a right answer to the task.

Asch's lines experiments

During the 1950s Asch conducted a series of studies looking at majority group influence (Asch, 1951, 1952, 1956). In one study, he asked participants to make judgements between the length of a standard line and the length of three comparison lines. In each of 18 trials, one of the comparison lines was equal in length to the standard line and the other two either longer or shorter.

Figure 25.1 gives an example of the stimuli used. After seeing the lines, participants were asked to say which of the comparison lines was the same length as the standard line. Of a control group of 37 people, 35 judged the correct line, showing how unambiguous the task was.

In the experimental condition, participants were asked to give their judgements out loud. They were seated in a semicircle in groups of seven people: six research confederates and themselves. The confederates always gave the same predetermined answer as each other. Sometimes this was a correct answer but on 12 trials they gave an obviously incorrect answer. To make sure the participants were subjected to influence they were also seated in position six out of the seven. This meant that they would hear the responses of five confederates (seated in positions one to five) before having to give their own answer.

The results were astounding. Compared with the control group, where fewer than 1% of errors were made, the experimental participants made on average 37% incorrect responses. The amount of influence differed across participants: 25% gave no incorrect responses, which means that a staggering *75%* made at least one error; 5% conformed to the group opinion every time! When asked about their feelings after the experiment, those who had conformed said they felt uncomfortable, anxious, sad and lonely. They said that they knew they were seeing different things from the rest of the group but felt more and more uncertain about their own private judgements. Others remarked that they knew they were correct but did not want to stand out from the rest of the group and so went along with them.

On the basis of this work, Asch thought that the fear of social disapproval was a central component in majority influence. He tested this by replicating the lines experiment but this time participants made the judgements either out loud (publicly) or privately. Although the error rate dropped to 12.5%, some people continued to conform. The thing that seems to reduce the likelihood of conformity most is when a participant has a supporter in the group and is not the only dissenter.

Self-test: Name two influential researchers in conformity.

Informational and normative social influence

Two important explanations for conformity have focused on the role of *informational* and *normative social influence* (Cooper *et al*., 2003; Deutsch and Gerard, 1955). When asked to make a judgement in the presence of other people, we want to be 'right' and also want to make a good impression on other people. To try to be 'right', people can use their own ideas or their perceptions or what other people say.

The conformity experiments we have looked at put the person in the position of choosing between these information sources. Informational social influence is the notion that we seem to go with information derived from others, rather than from ourselves, because it removes ambiguity in the situation. Support for this idea has come from numerous studies (e.g. Allen and Levine, 1971; Baron et al., 1996).

Recall Sherif's autokinetic experiment, which comprised a truly ambiguous task. The effect he found is consistent with informational influence because participants could not rely only on their own judgement, they needed help from others. The less you can rely on your own perception of the world, the more likely you are to be influenced by others. This is called the social reality hypothesis (Sherif, 1936).

Normative social influence says that conformity is caused by the desire to be liked and accepted and also the desire to avoid being disliked and not accepted by others. If we agree with the majority, this should maximise the chances of our being liked, whereas non-conformity may lead to negative evaluations about us by others in the group. For instance, by making group members dependent on each other it has been shown that conformity rates increase (Deutsch and Gerard, 1955). Cross-cultural work has shown more conformity in cultures that place a high value on collectivism versus those that have more of an individualistic society (see Bond and Smith, 1996).

The degree of informational and normative influence varies across situations but, in some instances, they both play a role. For example, people may conform and change their judgements *publicly* to be in line with the majority because they want to be liked by others. In this case, the likelihood is that they will not change their *inner beliefs*. However, if they also respect and use information provided by others, they may also change their private thoughts and beliefs. These findings have led to a distinction between compliance (or public conformity) and conversion (or private conformity). The distinction between normative and informational social influence is an example of a dual-process dependency model (Abrams and Hogg, 1990; Turner, 1991).

Self-test: What are informational and situational influence?

Social identity and social influence

The dual-process view has been criticised as a complete appraisal of conformity processes because it underestimates the role of social identity as an influence factor. Social identity is basically a person's sense of who they are, derived from being a member of a particular group (Brown, 2000b; Tajfel, 1982).

Social identity theorists propose that another type of influence, called referent informational influence, is important in conformity. This argues that we conform because we are group members and *not* to avoid social disapproval. We conform not to other people but to group norms (Hogg and Turner, 1987). We do this through a self-categorisation process, which suggests that members of a group seek out the group norm to minimise differences between members of the group (the in-group) and maximise differences with other groups (the out-group). This process leads us to behave in ways consistent with our group's norm and it is this that produces social identity (see Brown, 2000b; Turner, 1985).

This approach has also been influential in studying group and intergroup behaviour (see later in this chapter). Having found that people seem to be influenced by a majority position, we now turn our attention to situations in which a minority can also influence individual decisions.

Conversion or minority group influence

History tells us that minorities can exert significant powers of social influence. For example, the suffragette movement of the 1920s gradually changed opinions to a degree that allowed women eventually to gain the vote. Try to think of other examples where minorities have, over time, changed the majority viewpoint.

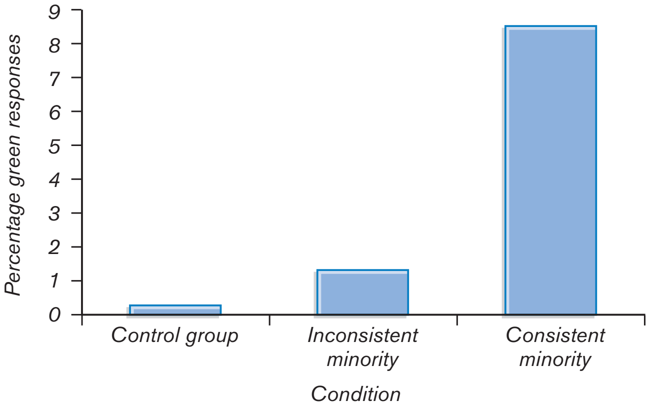


Figure 25.2 Percentage green responses given by majority participants in the Moskovici, Lage and Naffrechoux (1969) study

Serge Moskovici was the first social psychologist to look at how minorities can influence other group members, in his genetic model of *minority influence* (see Moskovici, 1976; Wood et al., 1994). He argued that because minorities do not have access to normative influence (they are, of course, fewer in number than the majority) and are often thought of by the majority as a 'bit strange' for holding their dissenting views, they have to rely on behavioural style. For instance, minorities have to be consistent in their arguments over time and with other members of the minority (i.e. show consensus).

Self-test: Name the key factor in minority influence.

Moskovici et al. (1969) demonstrated the role of consistency by getting participants to rate the colours of different slides in groups of six. They were presented with a total of 36 slides, all obviously blue but differing in intensity, and asked to judge aloud the colour of each slide. Of the six group members, two were confederates who in one condition answered 'green' on all the trials (consistent condition) and in another condition answered 'green' on 24 trials and 'blue' to 12 slides (inconsistent condition). There was also a control group that did not contain any confederates.

Figure 25.2 shows that members of the majority in the consistent minority condition gave the obvious incorrect response of 'green' significantly more often than either the control or inconsistent minority conditions and that the inconsistent minority condition was not very different from the control condition. It seems that a consistent minority has an impact on the public judgements of a majority.

Another study, by Moskovici and Lage (1976), compared inconsistent and consistent minorities and inconsistent and consistent majorities using a similar paradigm as before but also including the private responses of people after the influence. As expected, those participants exposed to a consistent majority conformed 40% of the time. Those exposed to a consistent minority conformed 10% of the time, replicating the earlier work, and those to an inconsistent majority 12% of the time.

This shows that consistent minority influence is just as effective as inconsistent majority influence. But the main finding of the study was that the only people who actually changed their private views were those in the consistent minority condition. This raises the question: 'Do minorities and majorities show influence because of different processes?' Moskovici's answer was 'yes!'.

Moskovici's dual-process model

This model extended Moskovici's genetic model and argued that majorities bring about direct public compliance because of normative and informational influence, without much 'thinking' going on. Minorities, by way of contrast, bring about indirect and private change because majorities actively think about the minority view, which leads to cognitive conflict and more cognitive resources applied to the judgement (Moskovici, 1980). Moskovici calls this the conversion effect. So the rule of thumb seems to be that majority influence equals compliance, minority influence equals conversion. This position has been supported by a number of studies (e.g. Moskovici and Personnaz, 1986; Nemeth, 1986).

Single process account

Latané and Wolf (1981) argue that social influence is a single process. There is a quantitative difference between majority and minority influence, not a qualitative one. They differ only in the strength of their influence effects. Drawing on social impact theory, Latané and Wolf propose that there are more sources of influence evident in majority conditions. This is important because influence seems to increase with an increase in the number of *sources* of influence. The main sources of influence in conformity experiments are the numbers of people. This influence is in a negatively increasing fashion so that the first source has the biggest effect, the second also shows an effect but not as big as the first and so on (see Figure 25.3).

Because majorities contain more people they should have a greater effect and as we have seen they seem to. Wolf (1985) showed that in mock jury situations, when participants were asked to make their response privately, minorities and majorities showed influence but the latter produced greater influence – a difference in size, not kind (see Brown, 2000b, for a review of this issue).

Self-test: What is another word for minority influence?

So far we have looked at how groups of people can influence the thoughts, feelings and behaviour of others. With this in mind, let's turn now to look at how groups make decisions. The first thing to do is to see how the performance of individuals is affected by the presence of others in our social environment. The questions we are asking are: 'Does a person's behaviour change in the presence of others?', 'Does an audience or being a member of a group affect their performance?' and 'Why is this?'.

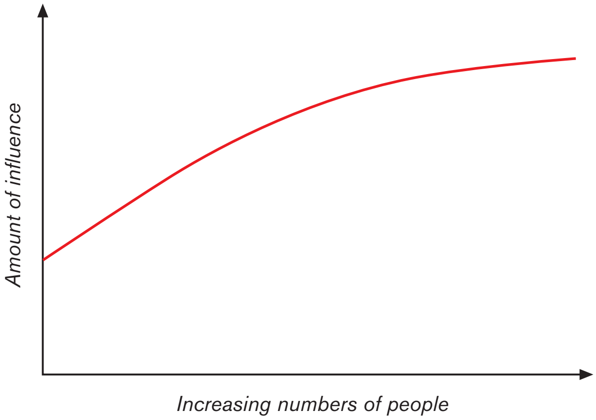


Figure 25.3 Degree of social influence by numbers of people: the relationship is in a negatively increasing fashion

Social facilitation and social inhibition

Social facilitation and social inhibition refer, respectively, to the findings that people appear to get better at well-learned tasks and worse at difficult tasks when in the presence of others (Kerr and Park, 2003). Zajonc (1965) produced a model to explain these processes, which he called drive theory (see Figure 25.4). He argued that the presence of others when performing a task causes us to be in a state of arousal: we are alert and ready. This arousal acts on a person's most likely responses. So, for instance, a good runner will perform better when being watched because his or her most likely response is running fast (i.e. social facilitation). In contrast, a poor runner's likely response is not running fast. In this case, the arousal will lead to decreased performance or social inhibition.

Self-test: People getting better at a well-learned task while being observed by others is called what?

Cottrell's (1972) evaluation apprehension model extends Zajonc's work by stating that people are aroused in the presence of others because people learn that social approval and disapproval (or perceived rewards and punishments) are dependent on how we are evaluated by others. Support for this position comes from studies that have shown no facilitation when the audience is not attentive to the participant's behaviour, but facilitation when they do attend (Cottrell et al., 1968). Other psychologists have argued that facilitation occurs only when people are unable to monitor the audience because they do not receive any cues about how the watchers are evaluating their performance (Guerin, 1989).

More recent work has focused more on how attention processes (see Chapter 13) alter when in the presence of others (e.g. Manstead and Semin, 1980). The general argument is that attentional capacity is overloaded when people perform a task in the presence of others. Do they attend to the task, the audience or what? Overload leads the person to focus on only a few central cues.

For instance, in one study, people were shown actually to increase their performance on difficult attentional tasks (such as the Stroop colour-naming task) when in the presence of others (Monteil and Huguet, 1999). This showed that people were better at reporting the colour of the ink in which a colour word is written (e.g. 'green' written in red) when others were present. Attention has been focused on the colour of the ink, which is what participants were instructed to do. (Go to Chapter 16 for a discussion of the Stroop effect.)

So we see that other people can affect our performance on tasks – they can change the way we behave. This focuses on an individual's behaviour, so the question we now ask is: 'What is different about the performance of people in a group scenario compared with individual performance?'

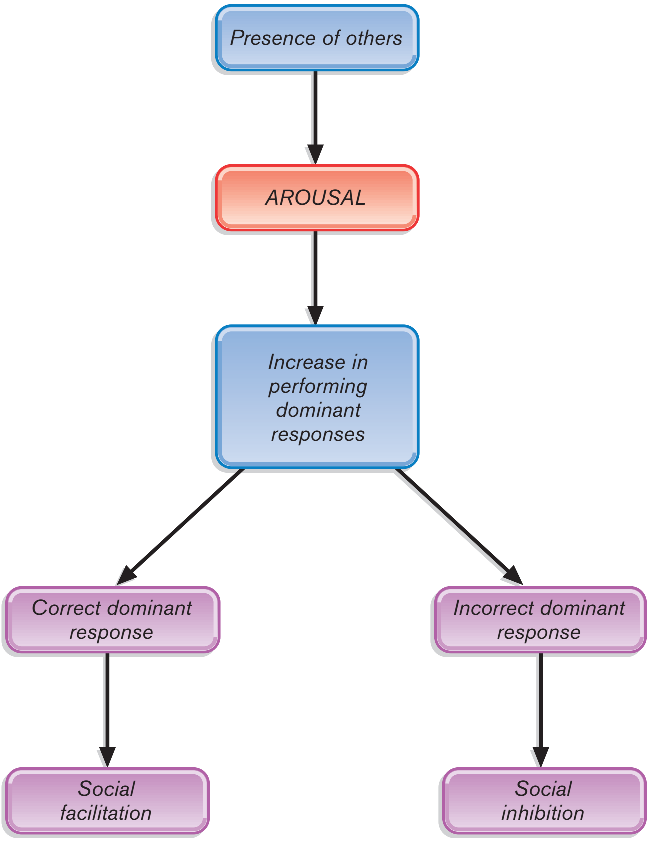

Presence of others
AROUSAL
Increase in performing dominant responses
Correct dominant response
Incorrect dominant response
Social facilitation
Social inhibition

Figure 25.4 Zajonc's drive theory

Group size and performance

Increasing group size leads to a decrease in individual effort and performance. In 1931 Ringelmann showed that as group size increases, the amount of effort each individual person puts in decreases. For instance, people in groups of eight, nine or ten will put less effort into a task compared with individuals in groups of two, three or four (see Focus point 25.1).

This is called the Ringelmann effect. One explanation for this effect is social loafing (Latané et al., 1979). This says that people work less hard on tasks when they think that others are also working on the task. In effect, they can 'loaf' about. People are less motivated to try at the task.

Another explanation is referred to as free riding (Kerr, 1983). This is the idea that group members sometimes come to believe that their own efforts are not that important to the group because of the efforts of other group members. They effectively leave the decision to other group members while reaping any rewards that result.

Self-test: What is the Ringelmann effect?

This all sounds rather depressing. When in a group we are motivated to leave things to other people. All is not lost, however, because at times we take into account social

FOCUS POINT 25.1

The Ringelmann effect

Max Ringelmann was an agricultural engineer who was interested in the efficiency of various types of pulling techniques used in farming. During the later part of the nineteenth century he did a number of experiments. In one of these he got students to pull on a horizontal pole that was connected to a machine that measured the force exerted. The students pulled either by themselves or in groups of different sizes.

As you'd expect, Ringelmann found that the force exerted increased as the group size also increased. No great surprise there. However, he also observed that the force exerted did not increase in proportion to the numbers of people pulling. For example, if by themselves people on average pull about 85 kg you would expect that in a group of five the amount pulled would be five times the original. This was not the case and, in fact, the force exerted per person decreased as group size increased. It seemed that the bigger the group, the less hard individual people pulled.

Figure 25.5 shows how much force was exerted per person for different group sizes. It's clear that the bigger the group, the less force is exerted by each individual.

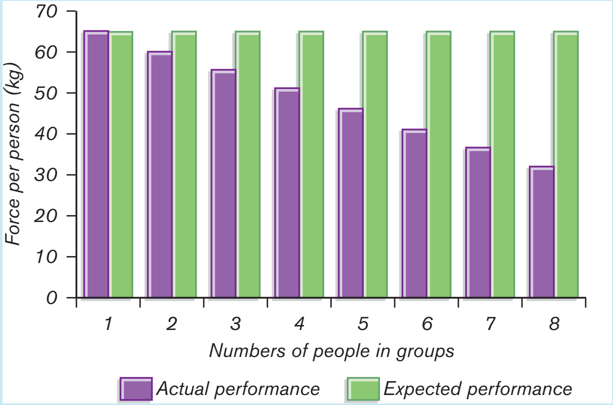


Figure 25.5 An example of the Ringelmann effect

compensation when dealing with other group members. This is the tendency for some group members to work harder on tasks when they perceive other members cannot do the tasks or are not prepared to put in the effort (Guzzo and Dickson, 1996). Can you think of occasions when you have socially compensated another person in a group situation or when you have been compensated for yourself?

Group decision making

Groups are responsible for many decisions we make and how we behave every day. This includes rather innocuous decisions like which pub to go to while on a pub crawl with a bunch of friends (hic!), to more important ones such as those that juries make in criminal trials. You have probably heard the adage that 'two heads are better than one' in making decisions. Is this true? What sorts of decisions do groups make? Are they the same or different from those that individuals make? What sorts of psychological processes are important in group decision making?

Group polarisation

Early work showed that the decisions made by groups tended to be more risky than those made by individuals (Wallach et al., 1962). This is called the *risky-shift phenomenon* (Stoner, 1968). However, later work showed that group decisions can also be more conservative than individual decisions. This led to the idea of group polarisation (Wetherell, 1987; see also Myers and Lamm, 1976).

Formally, this suggests that group decisions become more polarised than individual ones (Cooper et al., 2003). For example, getting individuals who already favoured the war in Iraq in 2003 into a group discussion with other like-minded people would result in a consensual group decision that favoured the war even more. Myers and Kaplan (1976) showed that mock juries become more extreme in their decisions of guilt or innocent if they are shown to favour guilt or innocence before the group discussion.

Look at Figure 25.6. Group polarisation in decision-making groups is the tendency to shift their opinions towards more extreme views. For example, if groups begin with a position that is slightly in favour of a particular view

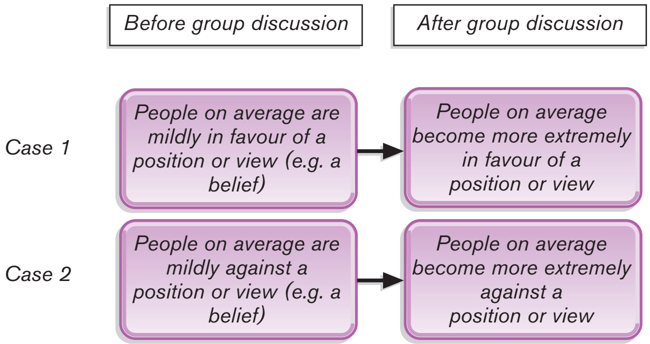

Before group discussion
After group discussion
Case 1
People on average are mildly in favour of a position or view (e.g. a belief)
People on average become more extremely in favour of a position or view
Case 2
People on average are mildly against a position or view (e.g. a belief)
People on average become more extremely against a position or view

Figure 25.6 Group polarisation
Source: based on Baron and Byrne, 2003: 508

they will end up holding a view more strongly in favour of the position. Exactly the same will happen when the initial position is slightly against a particular view. In other words, groups shift their opinions towards more extreme points of view, but in the same general direction as the original opinion.

According to Hogg and Vaughan (2002), group polarisation can be explained from three perspectives: a persuasive arguments perspective, a social comparison perspective and a self-categorisation perspective.

Self-test: The shifting of individual opinions to more extreme views after group discussion is called what?

Polarisation through persuasive arguments

The idea here is that in groups people are persuaded by new information that supports their original thinking on an issue. People in groups of like-minded individuals will hear not only arguments that they have heard before but also new ones that support their beliefs (Larson et al., 1994). Because of this, the views of each member of the group will become more ingrained, with the result that the view of the group as a whole becomes more polarised. Repeated expressions of one's own and others' arguments or beliefs to supportive group members have also been shown to lead to polarised group opinions (Brauer et al., 1995).

Polarisation through social comparison

This approach is based on two assumptions. First, people need to evaluate their own opinions and behaviours by comparing themselves with other group members. Second, people seek a positive image of themselves and need to get approval and avoid social disapproval. Because of this, in group discussions like-minded people will move their position to one that reflects the socially desirable opinion. This will maximise rewards.

Codol (1975) has suggested that during the process of learning which beliefs are the most socially desirable, a person will compete with other group members to appear as the person most strongly in support of the position. This is called the *primus inter pares effect*, or first among equals effect.

Polarisation through self-categorisation

We have already met self-categorisation when we talked earlier on about conformity. Recall that as group members we create an impression of what the group norm is for our group (the in-group) compared with the perceived norm for other groups (the out-groups). We effectively set up a prototype that describes best what the group has in common and what makes it different from an out-group (Turner et al., 1987).

The person who is the least different from other in-group members but the most different from out-group members is the prototype. This prototype person is the norm for the in-group and his or her arguments are the most persuasive. The movement of group members' opinions towards the prototype leads to polarisation.

Groupthink

Probably the most famous example of a group's decision becoming polarised is groupthink (Janis, 1972, 1982; Janis and Mann, 1977). Groupthink is a type of thinking among very cohesive groups that is based on members wanting to reach a unanimous decision irrespective of a motivation to use logical and reasoned decision-making processes. Based on actual accounts of poor group decision making (such as the Bay of Pigs fiasco in 1961 when President Kennedy and a team of advisers sent some Cuban exiles on a disastrous invasion of Cuba), Janis and Mann were able to describe the antecedents, symptoms and consequences of such faulty decision making (or groupthink). (These are shown in Figure 25.7.)

Groupthink occurs when a number of conditions are present. These are:

- when the group is cohesive
- when the group is isolated from external sources of information
- when the group leader clearly favours a certain outcome judgement
- when the decision is made in stressful or demanding circumstances
- when members of the group are ideologically consistent with each other.

These conditions give rise to various outcomes, which together combine to give rise to poor decisions being made. For instance, groups will not question their belief that they are right, they ignore or play down information that may question their belief, they feel invulnerable, they exert extreme pressure on people who disagree with them in the group and they invariably stereotype out-groups.

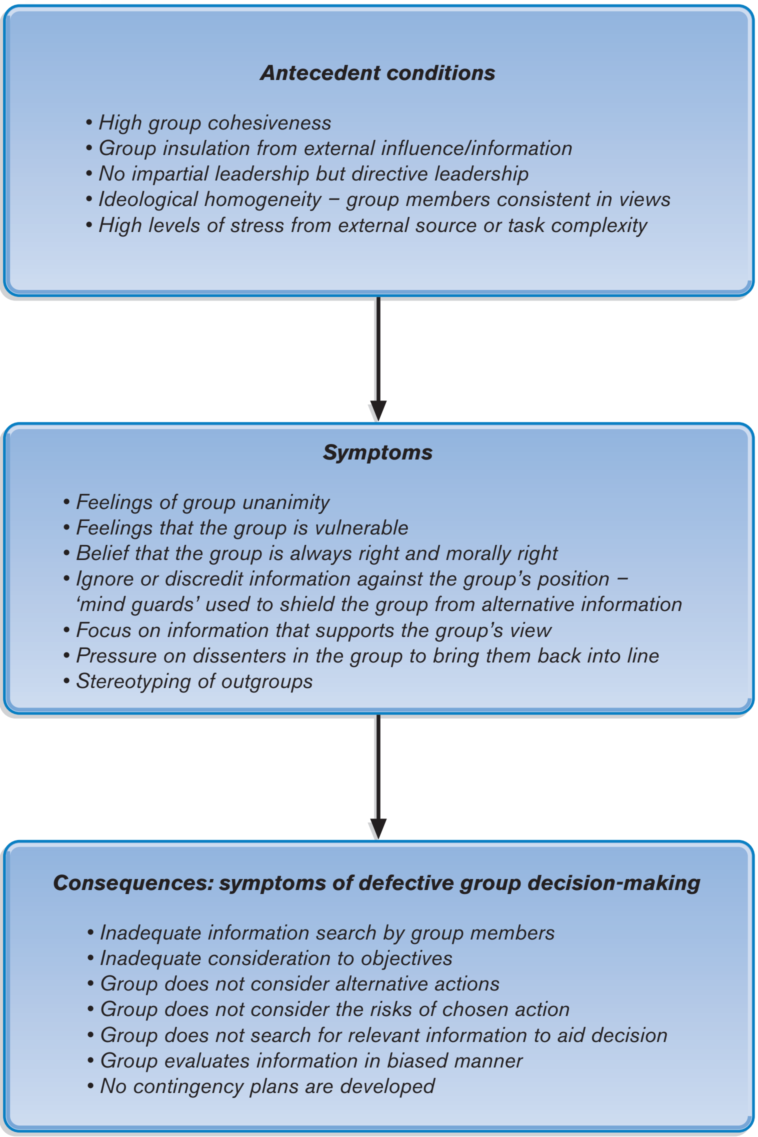
While some studies have been able to validate the model in other descriptive investigations (e.g. Hart, 1990), there is mixed evidence about the central role of cohesiveness based on experimental studies. Cohesiveness has been shown to increase, decrease or neither with faulty decision making (e.g. Leana, 1985; Turner et al., 1992). (See Activity box 25.1.)

Self-test: Is groupthink an example of polarisation? How?

Obedience to authority

In most of the examples of social influence we have seen so far, the source of the influence is indirect. Conformity studies do not answer the questions 'What happens when people are explicitly pressurised by authority figures to conform to requests?', 'Will people obey at all costs?'.

Stanley Milgram's work on obedience to authority is one of the most famous series of psychological studies ever conducted (Milgram, 1963, 1974). In one of his studies, participants were told that they were going to do a study on



Antecedent conditions

- *High group cohesiveness*
- *Group insulation from external influence/information*
- *No impartial leadership but directive leadership*
- *Ideological homogeneity – group members consistent in views*
- *High levels of stress from external source or task complexity*

Symptoms

- *Feelings of group unanimity*
- *Feelings that the group is vulnerable*
- *Belief that the group is always right and morally right*
- *Ignore or discredit information against the group's position – 'mind guards' used to shield the group from alternative information*
- *Focus on information that supports the group's view*
- *Pressure on dissenters in the group to bring them back into line*
- *Stereotyping of outgroups*

Consequences: symptoms of defective group decision-making

- *Inadequate information search by group members*
- *Inadequate consideration to objectives*
- *Group does not consider alternative actions*
- *Group does not consider the risks of chosen action*
- *Group does not search for relevant information to aid decision*
- *Group evaluates information in biased manner*
- *No contingency plans are developed*

Figure 25.7 Antecedents, symptoms and consequences of groupthink
Source: adapted from Janis and Mann, 1977

the effects of punishment on learning and that they would be either a 'teacher' or 'learner' in the study. In reality, the participants were always assigned the 'teacher' role while the 'learner' was a confederate.

The participants saw the learner being strapped into a chair and having electrodes attached to them. They also overheard the experimenter explaining to the learner that they were using paste to attach the electrodes to try to stop any burning or blistering and that although the shocks might be painful there *should* be no lasting damage. They also overheard the learner telling the experimenter that he had a heart condition.

Participants were then taken to an adjacent room and told that they were to give an electric shock to the learner every time the learner made a mistake on a paired associates learning task. They were sat in front of a shock generator (see Figure 25.8) and told that the voltage in the shock would increase with every mistake made: 15 volts for the first, 30 for the second and so on. They were told to administer these progressive shocks by pressing the appropriate buttons, each marked with a voltage ranging in intensity from 15 to 450 volts. In addition, certain shock levels were labelled with, for instance, 15 volts labelled 'slight shock', 375 volts 'danger: severe shock' and 450 volts 'XXX'. Finally, participants were given a 45-volt shock themselves to give the impression that the shock generator was real (see Class activity box 25.1).

As well as giving correct answers, the learner also made errors for which the teacher was to administer progressively greater shocks. At different shock levels, the teacher heard the learner say various standard things. For instance, at 120 volts they heard the learner say that the shocks were getting

ACTIVITY BOX 25.1

Overcoming groupthink

Imagine yourself in the following situation.

You are a Chartered Occupational Psychologist and have been employed to advise the UK government cabinet on what makes for a good group decision. The prime minister, who leads the cabinet, is a strong-minded and autocratic type. She doesn't really listen to everyone's opinions when making policy decisions. However, the cabinet members agree on most things, including their underlying political principles. One day another country invades and captures an island that, as far as the cabinet is concerned, belongs to the UK. The trouble is, it has been only a few years since this same cabinet has sent troops there, which was not very popular at the time among the voters. However, as far as the cabinet was concerned this was justified on humanitarian grounds. The invading country is led by someone whom no one in the ruling political party seems to like very much, although members of other political parties – and a lot of the British people – seem to think the invading leader is OK. The cabinet seems to think that members of other political parties do not know what they are talking about. You have heard it remarked that 'It is just the typical reaction you'd expect from them' and that 'Anything they say is not worth listening to'.

Now take a look at the antecedents and symptoms of groupthink in Figure 25.7. What advice would you give the cabinet and the prime minister to avoid making a totally disastrous decision in these circumstances? What kinds of things do you think can be done to try to ward off the likelihood of this group suffering groupthink?

CLASS ACTIVITY BOX 25.1

Ethics in Milgram's obedience study

First of all read the section entitled 'Ethics in social psychology' in Chapter 21. In this section, key ethical principles that guide studies in psychology are outlined. These are the protection of participants from harm, right to privacy, deception, informed consent and debriefing. Now read the section entitled 'Obedience to authority' in this chapter. In this section, we looked at how Stanley Milgram and colleagues investigated those factors that are important for understanding under which circumstances people obey an authority figure.

Get into groups of three, four or five. Take each of the key ethical principles in turn and discuss how Milgram could have designed his studies to address these. What are the main potential ethical problems inherent in Milgram's work? For instance: Is it ok to deceive people? What are the risks to the participants taking part? How would you get over these? Are there any benefits? If you were replicating Milgram's work, how would you ensure that each ethical principle was addressed?

uncomfortable; at 150 volts the learner demanded to be allowed to leave the study and at 250 volts the teacher heard the learner scream in agony. At 300 volts and above, the learner stopped responding completely to the task and the participant was told to treat these responses as errors and administer the next shock level. The first time a participant (the teacher) questioned giving more shocks they were told to 'continue'; the second time, that 'the experiment requires you to continue'; the third time, that 'it is absolutely essential that you continue'; and the fourth time, that 'you have no other choice, you must go on'. So the teacher was exposed to social influence from both the learner and the experimenter. The study finished when the participant refused totally to administer any more shocks or when they had administered three of the maximum voltage (see Figure 25.9).

A quite astounding result showed that 62.5% of people gave the highest intensity shock, the average being about

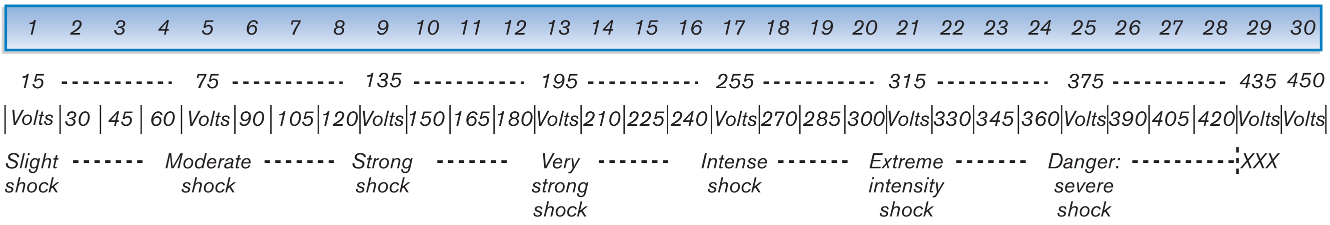


Figure 25.8 Milgram's shock generator

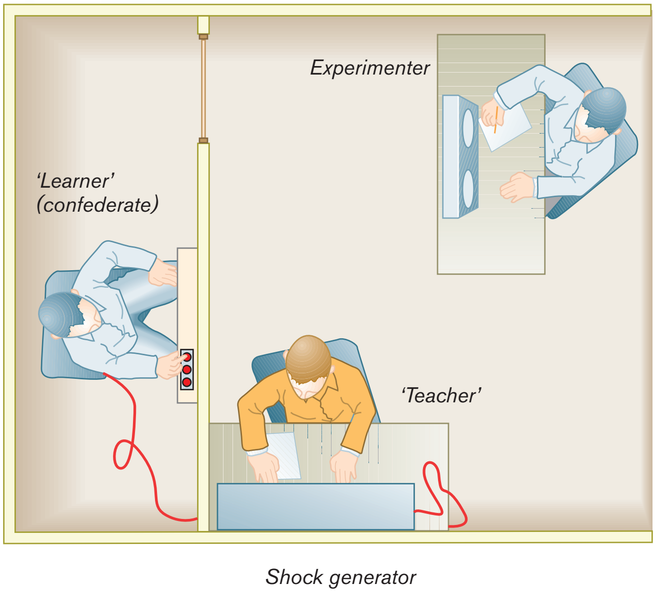


Figure 25.9 Layout of one of Milgram's obedience-to-authority experiments

360 volts (marked 'danger: severe shock'). These obedience effects have been replicated in many countries (Smith and Bond, 1998). Milgram subsequently went on to do a total of 18 studies looking at the factors that were important in obedience. These factors are described in Focus point 25.2.

Leadership and group processes

In many of the groups of which we are members, we come across leaders. Leadership is basically a role designated in a group for encouraging other members to realise the group's goals (Chemers, 2003). It is another form of social influence in this sense. The role is given to one person by other group members. Much research has been carried out on how leaders lead, who becomes a leader and the role of leaders in group decision making. For instance, we have already seen the importance of leadership style in groupthink. More recently, applied psychologists have been studying the role of leadership in the workplace (see VanYperen and van de Vliert, 2001).

The trait approach

Early views held that leadership qualities were inherited and this gave rise to the idea that some people are 'born leaders'. Later work has focused on whether there are particular personality characteristics or traits that leaders have and that non-leaders do not have (House, 1977). Most studies have produced only rather weak associations between certain characteristics and effective leadership (Yukl, 1998). For instance, leaders are more physically attractive, self-confident and sociable. Believe it or not, they are, on average, taller than non-leaders! Of all the factors that have been investigated, intelligence and talkativeness have been shown to be associated best with leadership. On the whole, the evidence that leaders have particular personality traits is equivocal.

FOCUS POINT 25.2

Key factors in obedience

Milgram conducted a total of 18 experiments in which he changed different aspects of the experiment to look at which factors are important in obeying authority. These factors are listed below.

Persuasion

The experiments start with participants having to administer rather harmless shocks. The participants have thus committed themselves to this course of action, which subsequently makes it difficult for them to change their minds.

Immediacy of the victim

This refers to the social proximity of the participant to the victim. Higher obedience scores are found when the victim is 'anonymous' ('out of sight out of mind'). In one study Milgram actually got the participants to hold the victim's hand on to the electrode to receive the shock. It seems that empathy with the victim plays a role here.

Immediacy of the authority figure

This refers to the social proximity of the participant to the authority figure. Obedience decreased when the authority figure was not in the same room as the participant and relayed instructions by telephone. It decreased even further when no instructions were given at all and the participant was allowed to choose their actions freely.

Group pressure

Participants were shown to increase their obedience when in the presence of other obedient peers and decrease obedience when disobedient peers were present. The presence of others behaving in either a similar or dissimilar way gives the behaviour legitimacy or illegitimacy.

Photo 25.1 Discrimination on the basis of which football team is supported

Leaders' behaviours

A clearer picture of leadership comes when we look at the behaviours leaders use in their groups. In a classic study, Lippitt and White (1943) investigated the effect of different leadership styles on group atmosphere, liking for the leader and group. Schoolchildren were assigned to one of three leadership style groups (with the leader in each group being a confederate), as follows:

1. An autocratic leader group: leaders were remote, focused only on the task, were very organisational in approach and dished out orders to group members.
2. A democratic leader group: leaders were always prepared to consider others' opinions and called for discussion and suggestion.
3. A laissez-faire leader group: leaders hardly intervened at all in this group. In effect, they left the group to do whatever it wanted.

From Figure 25.10 it is clear that group members disliked the laissez-faire leaders and autocratic leaders and liked the democratic leaders. Group productivity also differed between the styles. It was low in the laissez-faire condition, but high in the democratic one. Interestingly, Lippitt and White measured productivity when the leader was present or absent from the group. They showed that when autocratic leaders were present productivity was high but their being absent led to decreased productivity. Productivity in the democratic group was always high whether the leader was present or absent. Based on these results, it was proposed that the most effective form of leadership is a democratic one.

Self-test: What are the three types of leader?

Situational perspective

This argues that effective leadership depends on the situation, or context, of the group. For instance, in his contingency approach, Fiedler (1965) argued that group performance is produced by the interaction between leadership style and three situational characteristics. These are:

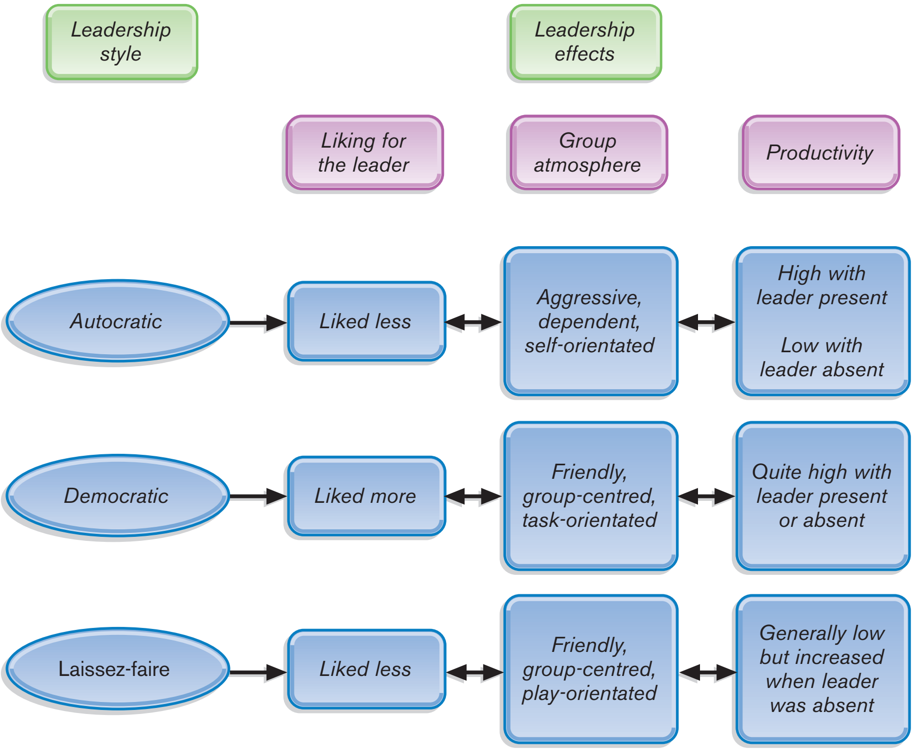

Leadership style
Leadership effects
Liking for the leader
Group atmosphere
Productivity
Autocratic
Liked less
Aggressive, dependent, self-orientated
High with leader present
Low with leader absent
Democratic
Liked more
Friendly, group-centred, task-orientated
Quite high with leader present or absent
Laissez-faire
Liked less
Friendly, group-centred, play-orientated
Generally low but increased when leader was absent

Figure 25.10 Lippitt and White's leadership styles and their effect on group behaviour and group productivity
Source: Hogg and Vaughan, 2002: 313

1 the relationship between leaders and members (leader–members relations)
2 how well the group's task is structured (task structure)
3 how much legitimate power the leader has.

Sound leader–member relations, a well-structured task and high legitimate power will lead to high situational control, thus making it easy for the leader to manage.

Intergroup behaviour, discrimination and prejudice

Having looked at conformity group processes and obedience we will now consider how groups *get along*, or do not *get along*, with each other (see Brown and Gaertner, 2003). Intergroup behaviour can be thought of as the actions of one group's members towards members of another group (Brown, 2001). Sometimes these actions are about conflict. Every day we are bombarded with media images of groups of people being in conflict with other groups. Just think of football violence and abuse when groups of opposing fans chant at each other and even become physically violent. What have psychologists to say about how groups behave and interact with one another? What explains intergroup conflict and prejudice? Why do groups discriminate against other groups?

Broadly speaking, we can think of prejudice and discrimination as being caused by three general factors (see Brown, 2000a):

1 personality type
2 environmental factors
3 group membership.

Personality and prejudice

The argument here is that certain aspects of an individual's personality predispose them to act in a discriminatory way to people or other groups they perceive as being different to them. Adorno *et al*. (1950) identified the authoritarian personality as being particularly important here. People with this type of personality are thought to be uneasy and hostile with people they consider to be inferior and overly subservient to people they believe to be superior to them. Adorno developed the F-scale (potential to fascism scale) to measure this personality type.

Although generating a lot of research, the personality approach has been severely criticised (see Brown, 2001). First, the approach ignores the effect of social context on the development of attitudes. People are attracted to a group because they see that group as holding norms they feel happy with. At the same time, group membership will affect how our beliefs change over time. Second, how does a person-centred approach that emphasises differences between people explain the observation that prejudice types are widespread in society? Third, the approach cannot account for changes in prejudice over time. Many examples of prejudice develop rapidly (e.g. the recent rise in anti-asylum-seeker attitudes in the UK) and this does not allow sufficient time for parents to change the ways in which they rear their children to take account of this new belief system. Finally, this personality approach takes an individualistic approach: that the behaviour of people when by themselves is essentially the same as when they are in groups. The fact that this is *not* the case has led to the study of environmentally based factors.

Photo 25.2 Robert Mugabe, Prime Minister of Zimbabwe (left), and Mikhail Saakashvili, who took 95% of the vote in Georgia's 2003 presidential elections. Which of these is an autocratic leader and which a democratic leader?

Environmental factors

This is also referred to as the conflict approach and sees intergroup conflict as a 'normal' response by everyday people in situations involving intergroup contact. The basis for the approach is group goals. In a given situation, if one group's goals are incompatible with another group's goals, conflict is more likely. The reverse is the case when goals are compatible (or concordant). In effect, in the first instance, groups are working against each other because they have different goals while in the second instance groups may be working together to achieve the same goals. The best-known supporter of these ideas is Mustafa Sherif.

Sherif's realistic conflict theory

Sherif (1966) argued that intergroup conflict is the outcome of a conflict of interests between an in-group and an out-group. When both these groups desire the same goal but cannot both attain it, then conflict arises. There is hostility between the groups reflected in negative attitudes towards the other group, competitiveness and discriminatory behaviour.

This approach (the realistic conflict theory) is seen in a series of three classic studies by Sherif and colleagues at the Robber's Cave State Park summer camp for boys in the USA (see Sherif, 1966). Before coming to camp the 12-year-old boys did not know each other. The studies involved three phases:

1 Forming the groups.
2 Creating intergroup competition.
3 Reducing conflict.

Groups were formed by first assigning boys to one of two experimental groups. In two of the studies, the groups were arranged so that any 'new friends' were assigned to different groups. In the other study, the boys never actually met prior to being assigned their group; they could not have made friends at all. Even before conflict had been introduced into the experiments Sherif observed that in-group favouritism had started.

To get the groups to compete, contests such as a tug-of-war were arranged. The boys were told that the winners would receive a prize and the losers would receive nothing. In other words, when one group won, the other lost. There was a conflict of interest between the groups. This is called *negative interdependence* and created hostile behaviour between the groups. For instance, the groups actually fought each other and destroyed and stole each other's property. In one study, each group was given a flag but prior to the competition one group set fire to the other's flag.

In addition, the groups exhibited in-group favouritism. They held negative attitudes towards members of the other group (e.g. they were 'sneaky') and positive attitudes towards members of their own group (e.g. they were 'friendly').

With the conflict generated, Sherif et al. wanted to see if they could reduce it. One way they tried was to create goals that no one group could attain by themselves. These types of goal are called superordinate goals. The boys in one group would have to work with those in the other group and they were therefore dependent on each other for achieving the goal.

One situation involved a truck in which the boys were travelling breaking down and the only way to get it started again was for both groups to work together and pull the truck. This was just before lunchtime so the superordinate goal was getting back to camp in time for lunch. Having to work together for the common goal generated a decrease in aggression towards the other group and a decrease in in-group favouritism.

Sherif's work is important because it highlights the role of competition in intergroup conflict. Other work has shown, however, that discrimination or prejudice can happen when interests do not conflict.

Group membership

Henri Tajfel and colleagues (1971) argued that the perception of others as belonging to other groups is enough to create discrimination. They demonstrated this using the minimal group paradigm in which people were first assigned to one of two groups depending on their preference for one of two artists: Vassilij Kandinsky and Paul Klee. This is important because liking for an artist is a very arbitrary distinction. Also, participants only knew which group they had been allocated to – they did not know to which group other people had been assigned. Then each person worked on their own on a task in which they were asked to allocate points to in-group members (i.e. people with a preference for the artist they preferred) and out-group members based on matrices like the one shown in Figure 25.11. They were told that these points would be converted into money. They did not allocate money to themselves.

Look at Figure 25.11. This is just one of the matrices presented to participants. They were asked to allocate points to members of their own group based on their liking for either Klee or Kandinsky (the in-group) and also for out-group members – people who preferred the other artist. For example, I personally prefer Klee. When given the matrix in Figure 25.11, I may choose that member 74 of my in-group (other Klee lovers) gets 25 points and member 44 of the out-group (the Kandinsky lovers) gets 19 points. Each matrix was presented at least twice so that the allocations could be reversed for recipients.

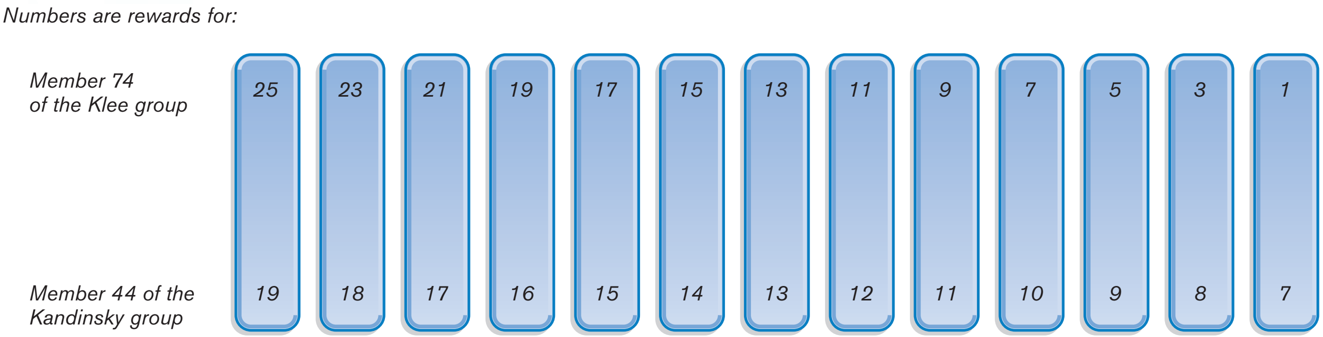
The results showed that people had a tendency to allocate greater rewards to members of their own group (the in-group) compared with the out-group. People will show favouritism to the in-group under circumstances when group allocation is arbitrary and when they have not met other members of either the in-group or the out-group. This is a very powerful effect and has been replicated in many studies over the years (see Brown, 2000a). However, there are conditions under which the paradigm does not show the discriminatory effect. For instance, when a person's responses result in negative outcomes for their own group members, no favouritism is shown (Mummendey and Otten, 1998; see also Bourhis and Gagnon, 2003).

Tajfel explained the minimal group effect in terms of social identity theory (Tajfel and Turner, 1986). This says that people are motivated to maintain a positive self-image. They do this through personal identity and social identity. Personal identity is those characteristics that make a person unique. Social identity is a person's sense of who they think they are, which is based on their group membership.

In general terms, the more positive the image people have of a group, the more positive the social identity and the greater the self-esteem of the group member. So in terms of the minimal group effect the only way a person can distinguish the two groups is in terms of a label (i.e. Klee preference versus Kandinsky preference) and the fact that they are in one of the groups. They are even anonymous to other members of the group. Because of this the only source of identity can be the in-group. Given that the in-group is so ill defined, the person initially does not derive much positive self-esteem. To change this they have to make their own group distinctive from the out-group, which leads to in-group favouritism (e.g. the allocation of greater rewards to the in-group members).

Reducing intergroup conflict

We have seen how easy it is artificially to induce intergroup conflict and, just from media reports, it seems that we are



Numbers are rewards for:

Member 74 of the Klee group	25	23	21	19	17	15	13	11	9	7	5	3	1
Member 44 of the Kandinsky group	19	18	17	16	15	14	13	12	11	10	9	8	7

Figure 25.11 One of Tajfel et al.'s matrices used in the minimal group paradigm
Source: Brown, 2001: 494

surrounded by instances of group conflict. What have psychologists told us that we can do about this? We have already seen from Sherif's work that creating conditions where groups are working towards superordinate goals may be effective. Another approach revolves around the contact hypothesis (Allport, 1954; Pettigrew, 1998). This view suggests that contact between members of different groups lessens intergroup hostility.

On the whole, the contact hypothesis has been shown to be valid for reducing intergroup conflict and discrimination (Brewer and Gaertner, 2003). But how does contact work? Pettigrew (1998) argues for four main processes through which contact has a positive effect on reducing intergroup hostility:

1. Learning about the out-group in terms of understanding their behaviours and the beliefs they hold.
2. Changing beliefs and attitudes through behaviour; some argue that contact works as long as the groups are working towards common goals (Hewstone and Brown, 1986); it has also been shown that the best form of contact between groups is through representatives who are seen as 'typical' members of the groups.
3. Getting members of the in-group to reappraise their own position, views or attitudes, which have led to intergroup conflict.
4. Trying to establish ties based on emotional processes; for example, one study showed that contact can reduce anxiety between Hindus and Muslims in Bangladesh (Islam and Hewstone, 1993), and between Catholics and Protestants in Northern Ireland (Paolini *et al.*, 2004).

In this chapter, you have been presented with some of the theories and evidence that have been proposed to study social influence and group processes. We looked at the types of group people are members of, how groups can influence the beliefs and behaviours of others, why people obey an authority figure's instructions, how groups make decisions and the causes and consequences of intergroup conflict.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe those factors that are important in social influence from either a majority or minority group.
2. Evaluate theories and evidence that have been used to study conformity and conversion.
3. Describe factors that have been used to understand group decision making.
4. Assess evidence that group performance may be affected by leadership style.
5. Evaluate evidence and theory showing that people obey authority figures.
6. Describe theories that have aided the understanding of intergroup behaviour in relation to conflict and prejudice.

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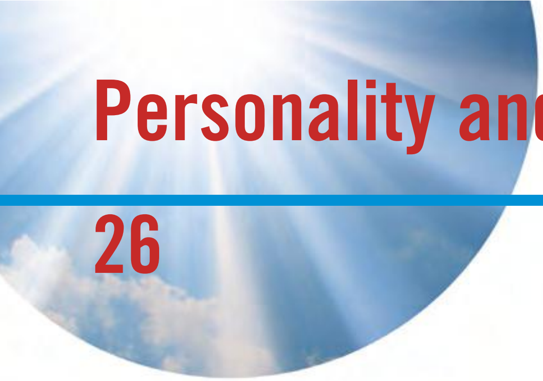
sectionsix

Simon Moore

Personality and intelligence

26 Psychology of emotion 380
27 Motivation 391
28 Thpsychology of the self 403
29 Personality 412
30 Intelligence 437
31 Psychometric testing 453



Personality and intelligence

26

Psychology of emotion

Route map of the chapter

The main function of this chapter is to describe what emotions are, what their function is and how they are researched. This chapter will outline the contribution of both physiology and cognition to emotional experience and describe the debate that discusses the importance of these two factors. The chapter also describes how emotions are measured and uses examples such as lie detection, ADHD in children, and temperature and violence to demonstrate the applied nature of emotional research.

Introduction

We experience many emotions in a single day (see Activity box 26.1) and if you have a PC like me you can run the whole gauntlet of emotions in 5 minutes if you experience problems with it. Just how many different types of emotion are there? Robert Plutchik (1980), an American psychologist, proposed that there is a basic set of emotions that all people experience. These are: fear, anger, joy, disgust, acceptance, sadness, surprise and anticipation. These eight emotions are also universally recognised by people from different locations and cultures worldwide. In fact, different cultures seem to express and recognise these emotions in almost identical situations (Hejmadi et al., 2000). These emotions are innate and directly related to adaptive behaviour that is designed to enhance our survival in just the same way as the fight or flight response is designed to help us survive.

The basic emotions

Table 26.1 shows some of the basic eight types of emotion, what triggers them and how we usually respond when experiencing them.

Plutchik suggests that emotions are made up of four pairs of opposites: joy and sadness; acceptance and disgust; fear and anger; surprise and anticipation. According to Plutchik

ACTIVITY BOX 26.1

What emotions do you encounter in a typical day?

Spare a few moments to think about a typical day for you. Think of all the people and situations you encounter. What types of feelings do you experience in a typical day? Make a mental list of these.

How many did you list? Psychologists have identified eight basic emotions that seem to be experienced universally (across gender, age and cultural groups). Can you name them?

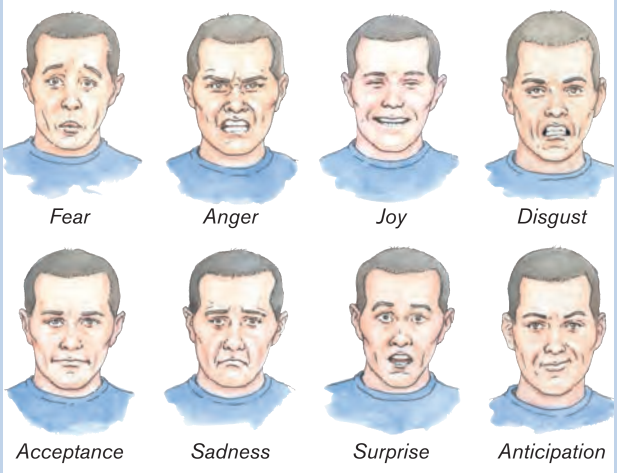


Figure 26.1 The eight basic human emotions (fear, anger, joy, disgust, acceptance, sadness, surprise and anticipation) are generally recognised in all cultures around the world.

TABLE 26.1 SOME OF PLUTCHIK'S EIGHT EMOTIONS AND THEIR CHARACTERISTICS

BEHAVIOURAL RESPONSE	TRIGGERED BY	EMOTION
Anger	Being prevented from doing something you want	Destroy the thing in your way
Fear	Any threat or danger	Protection often through 'freezing' so you are not noticed
Sadness	Loss of something important	Search for help and comfort
Disgust	Something gruesome, awful	Reject or push away the thing that is revolting
Surprise	A sudden unexpected event	Focus on the new thing, wide eyes take in as much as possible

we cannot experience opposite emotions at the same time. They are also either positive (joy, acceptance, anticipation and surprise) or negative (anger, fear, disgust and sadness). Positive emotions are seen to have a positive impact on our health while negative emotions can make us ill (Verrier and Mittelman, 1996).

Plutchik also suggests that we can experience blends of emotion. So, for example, joy and acceptance produce the complex emotion of love.

What exactly are emotions?

Now we have a clearer picture of what the main emotions are, the next question we need to ask is: what exactly is an emotion? In answer to the first question, emotions are feelings that accompany thinking. An emotion involves physiological arousal, expressive behaviour and conscious experience. So, when we are scared, our heart beats faster, our eyes become wide and we consciously judge that the situation is dangerous and we should be scared. What psychologists do agree on is that emotions contain both a cognitive and physiological element. What they do not agree on is which comes first. When we encounter a situation that scares us, do we become aroused and from this state of arousal deduce that we are scared? Or do we decide *mentally* that the situation is scary which then causes our physiology to react? Such questions sum up the key differences between the main theories of emotion (see Table 26.2).

TABLE 26.2 THE BASIC CHARACTERISTICS OF EMOTIONS

- Pure emotions do not last long and have a short duration. Mood, on the other hand, tends to last longer.
- Emotional experience can act as a motivation for action: the disgusted diner, for example, sending his uncooked steak back to the chef and putting his coat on to leave the restaurant. Where motivations are internal stimuli, emotions are reactions (responses).
- Emotional experience is elicited in part by conscious mental assessments. Such perceptual assessment can lead to very different emotional expressions. So getting an annual bonus might bring joy, which might turn to anger when you learn your co-workers all got bigger bonuses than you. Therefore cognitive appraisal is central to emotional experience.
- Emotional experience is either positive or negative, pleasant or unpleasant to us.

What are the functions of emotions?

We all feel and express emotions but what are they for? What is their purpose? There are possibly six main functions of emotional behaviour:

1. They are a source of information (they tell us if we have transgressed social and moral standards or tell us something important in our environment is happening).
2. They prepare us for action (arousal caused by emotional experiences makes us ready for action).
3. They help us communicate with others (they let others know our feelings, and let us know others' intentions). Ekman (1999) maintains that this is the primary function of emotion, to mobilise the individual to deal quickly with important interpersonal encounters. For example, **facial expressions** are involved in the formation of attachments between mother and baby prior to language acquisition.
4. They regulate social behaviour (through reinforcement we learn to avoid situations and people that bring about fear, shame, guilt and seek those stimuli that promote joy and happiness).

Photo 26.1

5 They can create cognitive bias and maintain self-esteem (it has been shown that people who are in a good mood not only are more confident and optimistic about their own abilities but are also more likely to rate others as being more honest, creative and helpful. The downside is the reverse can be true for people in a negative mood!) (Plies and Florin, 1992).

6 They may act as a coping mechanism for the stress we might encounter in life. For example, some research suggests that happy or emotionally positive people might live a better quality of life, cope with stress more ably and may also be more healthy and live longer! For example, Todaro et al. (2003) reported that in a study researching emotional experience and coronary heart disease occurrence, negative emotions continued to predict the incidence of CHD.

Self-test:

- Name the four characteristics of any emotion.
- What are the six potential functions of emotions?

What is the basis of emotional experience: physiology or cognition?

One of the main debates as far as emotions are concerned is whether emotions result from biological arousal to a stimulus or from cognitive appraisal of a stimulus. At one extreme, emotions can be seen as biological responses to situations over which we have little control. At the other extreme, there are psychologists who define emotions more by the conscious experience rather than by the biological response (Lazarus, 1991).

This has been an issue that has been at the forefront of research into emotional experience for over a century now. It has yielded a number of significant theories, each attempting to provide a universally accepted definition of the psychological basis of emotional experience.

Proponents of the biological explanation of emotion

Theorists such as William James and Carl Lange suggest that emotional experience is a direct result of physiological arousal. They differ in terms of where physiological arousal fits into the timeframe of emotional experience. For some, physiological arousal is seen to cause the emotion, for others such arousal is a signal system for the brain to act and produce emotions. Indeed, when reading about characters in literature who are attracted to someone, we are often told that their heart rate quickens. When disappointed we expect that sinking feeling in our stomachs or butterflies when we are nervous. When angry we talk of blood boiling or being hot under the collar. When scared our blood turns to ice, someone runs a cold finger down our backs and the hairs on our necks stand on end. Is there any basis for these expressions – does physiological arousal really decide which emotion we shall feel next?

James–Lange somatic theory of emotions

Psychologist William James and Carl Lange both reached a similar conclusion in the last decade of the 1800s. This was that the body informs the mind. For example, we know we are sad because we cry.

This became known as the James–Lange somatic theory of emotions. This theory suggested both that distinctive body changes/symptoms accompanied different emotions and that the perception of these changes/symptoms determined the experience of emotion (see Figure 26.2).

Differences between emotions are a direct result of the different patterns of physiological response associated with them. Thus, seeing something frightening instinctively triggers an integrated set of physiological reactions in our bodies and these specific patterns are perceived by individuals consciously and are subsequently experienced as the particular emotion of fear. At the core of this theory is the supposition that our brains are able to distinguish between different forms of physiological arousal. Thus feedback to the brain from such things as muscle tension, blood pressure, breathing rate etc. signals what type of emotion we are experiencing, which the brain then labels accordingly (see Research methods box 26.1).

More recent evidence for the physiological basis of emotion

The view that distinct physiological arousal accompanies different emotions has also received more recent research support. Levenson *et al.* (1990) reported distinctive patterns of autonomic nervous system (ANS) activity for anger, fear and disgust and there is also some evidence for a distinctive pattern for sadness (Levenson et al., 1991).

Rimm-Kaufman and Kagan (1996) have reported that hand and face temperatures were different in a sample of females viewing different film clips and being asked a series of questions. Those film clips rated as being positive resulted in an increased skin temperature, while skin

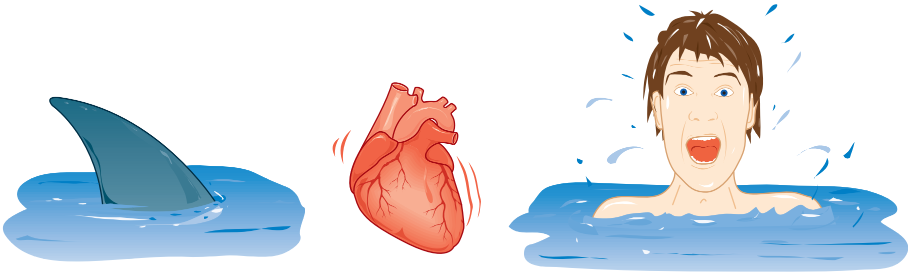


Figure 26.2 Order of events according to the James–Lange theory

RESEARCH METHODS BOX 26.1

Ax's emotion experiment

Ax (1953) designed an ingenious study, if somewhat ethically questionable by today's standards. He undertook an experiment to investigate the potential physiological correlates of emotion as suggested by the James–Lange theory. Recruited participants were told that they would be involved in an experiment to observe the physiological correlates of people with and without hypertension. This was a deception and used as a cover story to distract participants from the real nature of the study.

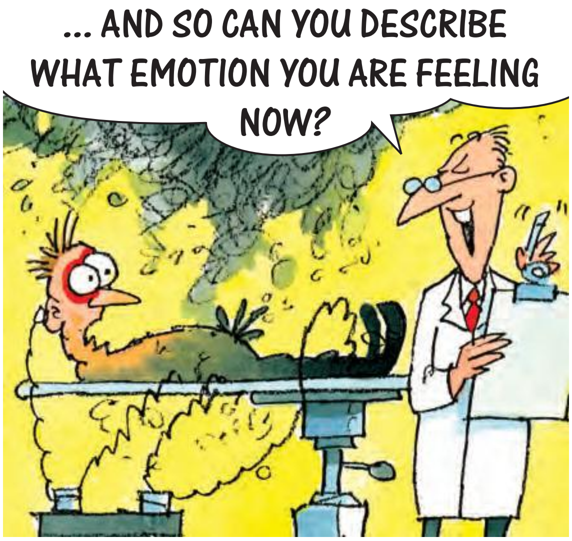
When the participants turned up for the study they were instructed to lie on a bench for one hour and listen to personally selected music. While doing this, their breathing rates, heart rates and *electro-dermal activity* (measured by monitoring changes in perspiration rate on the skin) were under constant measurement via electrodes attached to them, which led to recording machines in an adjacent room. Ax wanted to see if participants' physiological arousal differed between induced states of anger and fear.

Ax stage-managed the inducement of anger by having a technician enter the room to check the electrode attachments. The technician was instructed to be rough with the participants, and to make critical and sarcastic remarks about them out loud. Fear was induced rather alarmingly by administering electric shocks to one of their fingers, after which the technician would shout loudly about faulty wiring. This would be followed by a loud bang and lots of smoke from the adjacent room. Provided that his poor participants survived (!), Ax debriefed them as to the true nature of the experiment. His findings were interesting.

Under the anger condition, it was seen that blood pressure rose significantly more than under the fear condition, while heart rate decreased and muscle tension was seen to be greater. In the fear condition, electro-dermal activity was greater, as was the rate of respiration, than under the anger condition.

Ax concluded that different physiological reactions seem to accompany different emotions. We should be cautious, however, about how we interpret these results. For one thing, we cannot be sure that the physiological changes under the fear condition were not instead due to the threat of receiving an electric shock rather than a reaction to the shock itself. In the anger condition, some people may have been more irritated or shocked than angered by the comments and actions of the stooge technician.

Finally, Ax's experiment did little to untangle whether physiological arousal serves to produce emotions or merely accompanies them. Needless to say in today's world of research, from an ethical point of view, Ax would at the very least face a lawsuit – he might even be throttled on the spot!


... AND SO CAN YOU DESCRIBE WHAT EMOTION YOU ARE FEELING NOW?

ACTIVITY BOX 26.2

Does distinct physiological arousal give rise to distinct emotions?

It is not just things such as blood pressure, heart rate and breathing that the somatic theory considers important in providing the basis of emotional experience. Muscle movement and brain temperature have also been suggested as physiological feedback mechanisms influential in emotional experience.

The facial feedback hypothesis suggests that the facial muscles involved in emotional displays feed sufficient information to the brain for it to realise emotional experience. So this theory suggests that feeling yourself smile would make you happy. Smile now. Do you feel happier or just plain silly? This might sound too good to be true – if we simply make the appropriate facial expressions that go with emotions we should experience them. In all probability the major pharmaceutical companies would not like to hear this. Their production of anti-depressants would take a massive market dive overnight!

Is there any research evidence that this works? Well, there is, and it is called the *facial feedback hypothesis of emotion*. Davis and Palladino (2000) report a study where participants were either prevented from smiling or encouraged to smile by being instructed how to hold a pencil in their mouths. Holding a pencil in your teeth uses the same muscles that are used when you smile. Try it. Holding the pencil in your teeth does not prevent you from using your smile muscles, but holding it in your lips does.

Participants were then given cartoons to watch. Those who held a pencil in their teeth and thus were able to smile rated cartoons as funnier than did those who held the pencil in their lips and thus could not smile.

A second study that sounds equally bizarre had participants pronouncing different sounds such as 'eee' and 'ooh'. According to the researchers, making the 'eee' sound activates those muscles used in smiling, making the 'ooh' sound does not. It also results in more air being inhaled through the nostrils compared with making the 'ooh' sound.

Go on, try making the sounds, and breathe through your nose. If you didn't feel a fool with the pencil trick you certainly will now! Because more air is being inhaled, this acts to cool the forehead, which obviously houses the frontal lobes (the area of the brain associated with emotions). Results from this study indicated that the 'eee' speakers were more positive and happier than the 'ooh' speakers (Zajonc et al., 1989). The effect of tensing facial muscles altering blood temperature through breathing has been called the *vascular theory of emotional feedback* (McIntosh et al., 1997).

temperature was cooler when the participants were asked a set of threatening personal questions.

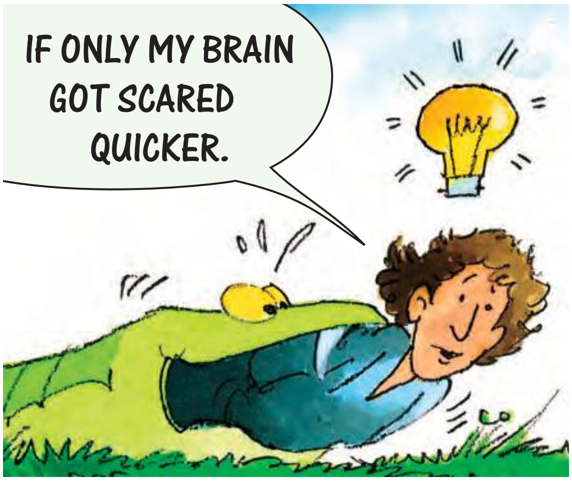
While it would seem that physiological arousal is intertwined with emotional experience, the question remains whether these physiological differences are actual causes of emotional expression or merely consequences of it (see Activity box 26.2).

Progression of the James–Lange theory

Physiologist Walter Cannon put forward the first formal challenge to the James–Lange theory. For Cannon (1927), emotional encounters were emergency situations that directly triggered a central brain process in the thalamus. Such brain stimulation had two simultaneous but independent outputs:

- One output led to the arousal system, which prepared the body to cope with the emergency (flight or fight response).
- A second led to the cortex where the conscious experience of the emotion was registered (am I feeling happy or sad based on past experience?).

Thus the symptoms of increased heart rate and quicker breathing were side-effects of general arousal, the body engaging in energy mobilisation. This physiological arousal


IF ONLY MY BRAIN GOT SCARED QUICKER.

according to Cannon was irrelevant to the subjective awareness of emotion. In other words bodily changes were consequences rather than causes of emotion. Emotional experience, then, began in the brain.

So according to the James–Lange theory, we might see a large snake moving towards us, wait to see what our physiology does and then we react accordingly. Cannon argued that this would be too slow. The snake would have bitten us and would be trying to swallow us before we even knew we were scared!

Cannon maintained that emotional experience was instantaneous with stimulation. In other words, we would see the snake, our body would become aroused anyway due to the new stimulus (sight of snake) and the brain would then automatically give meaning and purpose to this energy (avoid snake).

Despite Cannon's point about the slowness of recognising how we are feeling, if we follow the James–Lange theory, his own theory also contains a flaw. If the brain decides on emotional experience based on physiological arousal, then individuals who receive no physiological arousal signals should not experience emotion (as the brain has no information to act on). This is, of course, not true. Have you ever been in a situation when you did not know whether to laugh or cry? Been excited but nervous? How would the brain decide, from your physiological arousal, which emotion to choose?

Other contradictory evidence comes from work with physically injured individuals. Chwalisz et al. (1988) reported that people who had sustained spinal injuries, in which their spinal cords has been severed, still experienced the whole range of emotions as clearly as those people with fully intact spinal cords.

Are we any good at judging our arousal levels?

Two other theories of emotion point to how inaccurate we are at our levels of physiological arousal. These are known as false autonomic feedback (Valins, 1966) and excitation transfer theory (Zillman, 1978). Both theories suggest that there has to be more to emotional experience than mere physiological arousal.

Valins argued that the role of arousal in emotion was not as a direct energiser of emotional reactions but as a source of information to be used in a self-attributional process: in other words, not the feelings of physiological arousal but our interpretations of why we are aroused. It is therefore not the arousal itself that is important but the cognitions about the arousal that define arousal. To test this theory, Valins gave male students false heart rate feedback when they viewed pictures of naked women. Some participants were given false fast heart rates and others were given false slow heart rates. When given the choice, participants chose to keep the pictures of the women they had seen when they heard the highest heart rate signals. Valins suggested this was because participants had wrongly attributed their arousal (heart rate) as an indicator of attraction. This is known as the Valins effect.

The knock-on effect of arousal and emotional experience

Zillman (1978) argued that arousal is usually attributed to a single cause even when it is usually derived from a number of factors. He suggested that arousal which resulted from a primary emotional cause may be carried over to a secondary source. Zillman had people either exercise or rest prior to viewing an erotic film. Those participants who had exercised prior to the film reported the greatest levels of sexual arousal to it. Zillman argued that they had misattributed the arousal caused as a result of the exercising as a product of the second stimulus, the film. This process might explain why we sometimes bite people's heads off for the slightest inconvenience, when normally we would not bat an eyelid.

Imagine having an argument with your partner just prior to going shopping. You drive to the shops (still physiologically aroused by the disagreement), you search for a parking space, eventually finding one only to be beaten to it at the last moment by another driver. Already still aroused by the argument, it does not take much for you to perceive your arousal levels shooting up again in response to the selfishness of that other driver. You wrongly assume your current feelings are solely produced by this new situation. Whereas if you had not had the argument prior to going shopping you would have simply shrugged it off, now you sit in your car planning the total destruction of the other driver's car while they are blissfully unaware in the shop.

This principle might explain the rise of violent crime in hot weather. Anderson et al. (2000) report evidence from a variety of sources, centuries and continents that aggressive acts and violence increase during periods of hot weather. It could be that the irritation caused by the heat is transferred to secondary events so that we lose our patience more quickly and we have less tolerance for other people's behaviour.

Evaluation of the biological basis of emotion

Is it possible for us to detect the differential changes in our body between fear and, say, attraction? If we could anaesthetise your thought processes, would you be able to judge if you were scared, excited or angry, simply by how your breathing, blood pressure and heart rate responded? This is questionable and is the major line of attack of the opponents of a purely biological explanation of emotion. For example, feeling nervous often feels similar to excitement. You may feel no real difference between waiting to go on a big rollercoaster than when waiting to give a presentation in front of a group of people (despite, perhaps, *preferring* one over the other!).

One major criticism levelled at the biological approach to emotion is that we are not very good at detecting our levels of physiological arousal. If we cannot accurately detect changes in our physiology, how do we then decide on what emotion we should be experiencing? If we *are* to be able to judge which emotion we should be experiencing in a given situation, surely we must also take into consideration the nature of the stimuli and any past experience we have of it? If these two things are important, then cognition should play a major role in emotions.

We cognitively appraise situations we find ourselves in and compare with past experiences to try to produce the appropriate behavioural response. Thus, if you have been chased by a lion in the past, it is doubtful that you will hang around checking your pulse and monitoring your breathing the next time you encounter one! You'll probably feel scared straight away – your memory will quickly remind you what happened last time you encountered a lion. So it will be your thoughts that will probably produce the feeling of fear before you have time to take stock of your physiological reaction. Your cognition will also presumably question how on earth you came to be in a situation to be chased by a lion in the first place!

Self-test:

- What role did William James and Carl Lange suggest that physiology plays in emotional experience?
- What is the facial feedback hypothesis?
- What is the Valins effect?
- Name some problems associated with lie detection.

Cognitive explanations of emotional experience

Emotions must have some biological underpinnings. For example, some studies have shown that up to 60% of children with ADHD have increased behavioural problems (e.g. increases in aggression and violence) after consuming synthetic colourings such as tartrazine (E102), flavourings, preservatives and dairy foods, and coming into contact with chemicals such as detergents and perfumes (Ward, 1997). As another example, viewers of fearful faces show more distinct amygdala brain activity than when they watch pictures of angry faces (Whalen et al, 2001); the complexity of the relationship between the brain and emotions is seen with Parkinson patients who seem to show deficits in recognising fear and disgust in facial expressions compared with non-sufferers (Kan et al., 2002).

Biological factors alone do not, however, solely account for emotional experience. What is evident is that emotions involve physiological responses that are

APPLICATIONS BOX 26.1

Lie detection

Think about some of the crime dramas you may have seen on TV. Someone accused of a crime is undergoing stringent questioning while hooked up to a so-called 'lie detector' machine. Do you think there is such a thing?

The machine associated with lie detection is called a polygraph; it measures the physiological arousal of the body (in terms of such things as breathing and heart rate). The individual is asked a series of questions while his or her physiological arousal is monitored via the output on the polygraph. It should be remembered, though, that polygraphs are designed to detect emotional arousal and not, specifically, lies. Some questions are going to lead to a reaction regardless of whether the person being interrogated is guilty or innocent.

Suppose you were stopped in the street and asked if you would do a routine lie-detection test about a murder that had taken place near where you live. 'No problem,' you might think. You are hooked up to the machine and the interrogator asks questions like 'Do you like watching violent films?' With such questions it's hard to interpret what the questioner is trying to get at, so you might think he's trying to suggest you like watching violence because you are a violent person. You start to worry that you might give the wrong answer. Your physiology becomes aroused at your 'cognitive' anxiety, the arousal indicates stress on your part and, before you know it, you have been arrested for murder! Of course, it's unlikely it would end in this way, but you get the point.

Leonard Saxe (1994) has been a major critic of the lie-detector test. He suggests, unlike James, that our arousal is much the same from one emotion to another and so the polygraph will not be able to distinguish between irritation, anxiety, guilt and annoyance. He notes that around one-third of all lie-detection tests reach inaccurate conclusions.

TABLE 26.3 COMPARISON OF THE JAMES–LANGE, CANNON–BARD AND SCHACHTER–SINGER THEORIES OF EMOTION

Theory	Initial reaction	Secondary reaction
James–Lange	Physical reaction	Emotion occurs
Cannon–Bard	Emotion occurs at the same time as the physical response	
Schachter–Singer	Physical and emotional reactions occur at the same time	Situation–search environment

regulated by the brain and mental activity (see Applications box 26.1).

The proponents of the cognitive explanation of emotional experience suggest that we recognise different emotions because of our mental evaluations of our current situation. Erickson and Schulkin (2003) suggest that no specific emotion centre exists over and above cognitive systems in the brain and that emotion cannot be divorced from cognition.

The relevance of situation in emotional experience

Schachter and Singer (1962, 1964) put forward a theory that emphasised the importance of both physiological and situational factors in determining emotion. They called this the two-factor theory of emotions. The two-factor theory revised James's view that emotions are dependent on feedback from bodily changes and incorporated Cannon's point that emotions share the same bodily response of a generalised state of arousal. (See Table 26.3 for a comparison of the three theories of emotion.)

The basis of the theory suggested that autonomic arousal provided the energy and intensity of an emotion. In other words, physiological arousal by itself could determine the *quantity* but not the *quality* of arousal. Physiological arousal acted as a volume control to our emotional experience. As the same state of arousal seemed to accompany a wide diversity of emotions, Schachter argued that there had to be some other variable that gave each emotional state its distinctive feeling (quality).

This factor was the situation in which the arousal was experienced. For example, feeling aroused after eight shots of strong coffee will lead to less intense emotional arousal than realising the coffee shop is closed and being unable to get your morning caffeine rush! You would be aroused in both situations but you can cognitively attribute the cause of your arousal (to either the caffeine or lack of it). Therefore the kind of emotion felt depends on how the situation is interpreted and explained by the person experiencing it. So Schachter and Singer proposed an element of *cognitive attribution* as the critical factor in emotional experience. If a state of arousal is caused by a wild dog chasing you, this should be attributed to fear (wild animals can be dangerous) but if the dog chasing you were your pet then the attribution would not be one of risk but one of play and enjoyment.

Schachter and Singer tested their theory by injecting participants with epinephrine (a drug that produces high states of arousal). Participants were then placed in one of two conditions: either with another person who acted happily or with another person who acted angrily. It was reported that those participants who had the injections reported themselves to mirror the emotions of the people they were placed with. When participants were told about the effects of the drug, these effects were not seen – they attributed their feelings to the drug and not the other person.

The two-factor theory signalled a crucial rethink of emotional phenomena. Prior to this theory, social factors were seen only to modify the expression of biological arousal. Following this theory there was recognition that cognitive interpretations could shape emotional experience.

The role of cognitive appraisal

The suggestion that cognitive attributions are crucial in engaging in appropriate emotional responses was also proposed by Lazarus (1991). Cognitive appraisal of the situation determines the level of physiological arousal and the specific type of emotion to be experienced. In other words, in most emotional episodes interpretation and appraisal of the situation provided an immediate template for our emotional experience.

So learning principles are important here. If we have learnt that snakes have been dangerous in the past then the next time we see a snake we will be wary and we will exhibit the appropriate emotion of fear. Cognitive appraisal also explains why we can be disappointed by the actions of others through expectation. For example:

> Every time I come around for a visit I bring you flowers – flowers make you happy. So you associate my visits with

RESEARCH METHODS BOX 26.2

Measurement of emotions

How do we go about measuring emotions? From a psychological research methods perspective, there are two ways we can try to achieve this. We can try to measure physiological arousal and assume it is a viable correlate of emotional experience. Physiological events such as heart rate, breathing, electro-dermal activity and muscle tension have all been used as physiological indicators of emotional arousal. Many of these are measured by a polygraph, as we saw earlier in this chapter. The problem here is that we cannot easily separate what the emotion being experienced is from the physiological arousal input. All we can do is look at the levels of general arousal.

If we want to be more specific about the nature of the emotional experience, we can also ask people how they feel by employing self-report questionnaires. So we can ask them if they feel sad, how much do they feel sad and how long they have felt sad.

Examples of questionnaires presently being employed to measure people's emotions are the Positive and Negative Affect Schedule (PANAS; for more details on this see Watson et al., 1988: 1063–70) and the Mood Adjective Checklist (MACL). Both ask individuals to rate themselves on different types of emotional scale.

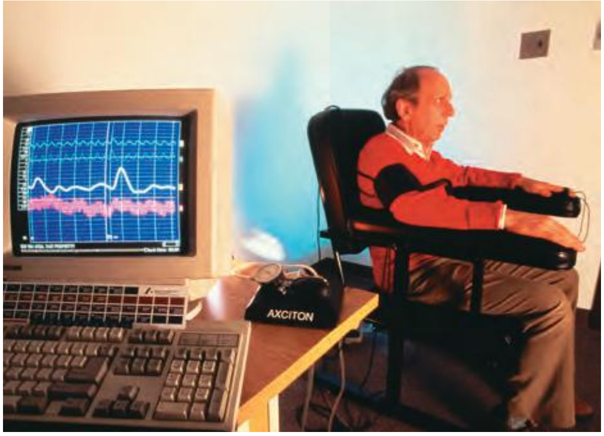


Photo 26.2 Polygraphs are often used to measure our underlying physiological behaviour in relation to emotional experiences.

> flowers, which make you happy. So via learning you expect to get flowers and expect to feel happy. When I turn up without flowers, you will be more disappointed with me than had I never brought you flowers in the first place!

Lazarus suggested that cognitive appraisals include such things as values, goals, beliefs and expectations. Zajonc (1984) maintains that cognitive appraisal theories might explain long-term emotional behaviour (such as depression, jealousy of others) but not explain instantaneous reactions like shouting out loud when you see a mouse (even a big mouse, a very big mouse!) (see Research methods box 26.2).

Hareli and Eisikovits (2006) demonstrated how cognitive appraisal is used by people to interpret others' emotions. They reported the results of two studies that examined how an injured person's knowledge that an apology was driven by one or more of the social emotions of guilt, shame and pity affected forgiveness. Their findings suggested that the knowledge that guilt and/or shame motivated the apology increased forgiveness. In contrast, knowledge that pity induced the apology *decreased* forgiveness.

Self-test:

- What are the two key factors in emotional experience according to Schachter and Singer?
- Name two ways in which we attempt to measure emotions, and name an advantage and disadvantage associated with each.

Summary

An emotion is a temporary experience, generated by a mental assessment of the situation, and is accompanied by both learned and innate physical responses. These emotions motivate a person's thoughts and actions and provide a way for individuals to communicate their internal states and intentions to others. While cognitive processes produce emotional responses, physiological arousal provides the intensity of emotional feeling.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the main theories of emotion and evaluate their contribution to our understanding of it.
2. Consider the extent to which physiological arousal plays a role in emotional experience.
3. Consider how our cognition influences our emotional experience.
4. Appreciate that emotions can be influential in changing behaviour.
5. Appreciate how research on emotions has been used to inform other areas of psychology.

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27

Motivation

Route map of the chapter

This chapter will deal with motivation and the 'whys' of behaviour. We will consider the major theories of motivation in attempting to evaluate what motivates us. The chapter is divided into three sections. The first considers biology as a motivational force. The second evaluates the role of cognitive and our mental processes in deciding what does and what does not motivate us. Lastly, we consider other motivational forces such as sexual motivation, sensation seeking and the need for achievement. We will also look at hunger and thirst as forms of motivation. The chapter will also differentiate between intrinsic and extrinsic motivational factors.

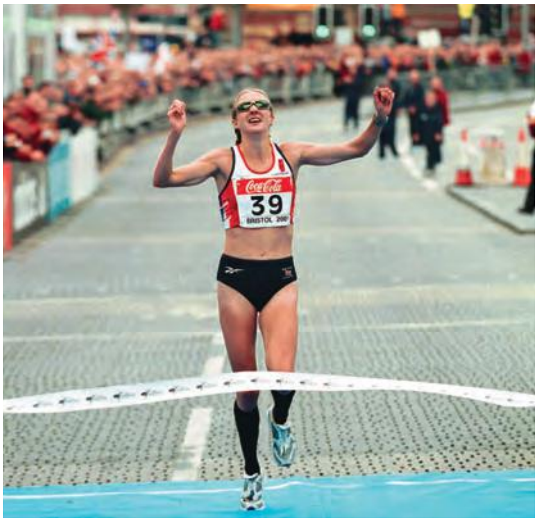

Photo 27.1 Some individuals seem highly motivated to achieve their goals in life.

ACTIVITY BOX 27.1

Money, the motivator

Take a little time to consider what would motivate you to work harder. If your boss paid you more money, would that make you work harder? Would you enjoy your job more? While your answer to these two questions may well be 'Yes', such experiences would probably be short-lived.

In general, money is a good motivator for those who need or value it enough. Generally speaking, the more you need money, the stronger it is as a motivational force. Pay rises motivate us when they lead to noticeable effects – so large lump sums would make us feel better off and would probably motivate us, at least temporarily. However, due to adaptation, we soon get used to the new standard of living brought to us by a pay rise and so the motivational effect offered by pay rises does not last long (Furnham, 1997).

For money to be a successful motivator, a clear relationship needs to be seen by the worker between his/her input (work) and subsequent output (money).

Introduction

Ever wonder why some people seem to be very successful, highly motivated individuals (see Activity box 27.1)? Where does the energy, the drive or the direction come from?

Motivational research has been applied to many areas of psychological investigation, such as health and work behaviour. For example, it has been established for many years that in health, rehabilitation professionals commonly believe that motivation of patients has an important role in determining their health outcome (Ibbotson, 1978). Korabik (1994) has suggested that lack of confidence in their own abilities has resulted in a lack of motivation for businesswomen in China and Hong Kong, and may be a factor in explaining why they have failed to reach comparable managerial levels as their male colleagues.

Motivation is an area of psychology that has been given a great deal of attention, especially in recent years. The reason is because we all want to be successful, we all want direction and drive and we all want to be seen as motivated (see Definition box 27.1).

DEFINITION BOX 27.1

Motivation

That which gives the impetus to behaviour by arousing, sustaining and directing it towards the successful attainment of goals.

So motivation energises people to act and moves them from a resting state to an active state. Motivation directs behaviour – it organises your behaviour towards a particular goalstate. It maintains behaviour until the goal is achieved.

Biological explanations of motivation

Most motivation theorists assume that motivation is involved in the performance of all learned responses; that is, a learned behaviour will not occur unless it is energised.

Where does the energy to engage in behaviour come from? Some theorists propose that our biological systems produce the drives for the attainment of goals.

Instincts and motivation

Among the first of the theories of motivation was the instinct theory of motivation (see Definition box 27.2).

DEFINITION BOX 27.2

Instincts

Instincts are automatic, involuntary and unlearned patterns of behaviour triggered by the presence of particular stimuli.

Instinct-based theories suggested that people were motivated to act in certain ways by their instincts. William McDougall (1908) suggested that humans have thousands of instincts (for example, reproduction, competition, work) which provide motivation for our behaviour. However, it has been recognised more recently that humans have fewer instinctive behaviours and so interest in instinct theory has waned. For example, babies are born with a unique ability that allows them to survive; they are born with the instinct to cry. Without this, how would others know when to feed the baby, know when he needed changing or when she wanted attention and affection? Crying allows a human infant to survive. One instinct that has been studied recently is the desire to pass on our genes to the next generation. Buss (1999) has suggested that this desire may provide the motivational forces for such things as love, romantic relationships, attraction and marriage.

Drives and motivation

Drive theory also emphasises the biological factors behind human motivation and is based on the concept of our body's homeostasis (see Definition box 27.3).

DEFINITION BOX 27.3

Homeostasis

Homeostasis is where an organism attempts to keep its physiological systems at a constant steady level. This works very much like a heating thermostat in your home – adjusting to rises and falls in temperature and responding accordingly. Homeostasis is, therefore, a natural tendency to keep the body in a state of equilibrium.

Clark Hull (1943) suggested that physiological disruptions to homeostasis produce drives (states of internal tension that motivate an organism to engage in behaviour that reduces this tension). So, for example, if we get too hot we take measures to try to cool ourselves down, wearing fewer clothes, keeping physical movement to a minimum, sipping cold drinks etc. (see Focus point 27.1). Hull maintained that reducing these tension drives is the ultimate goal of motivation. He also proposed the existence of secondary drives. So, for example, people learn that money can be used to satisfy the basic drives of food, drink and shelter – so earning money becomes a secondary drive. Drive theory is less influential than in the past, probably because it is recognised that people do not always act in ways to reduce these so-called drives. Dieting, for example, flies in the face of the drive to eat, while taking a trip on a rollercoaster runs contrary to the drive for safety. Freud also proposed that psychic drives, urges of the Id (as we shall see in Chapter 32), serve to drive our behaviour and so act as motivational forces.

Maintaining arousal as a basis of motivation

A third biologically based theory of motivation, arousal theory, maintains that people are motivated to act in ways that keep them at their optimum levels of arousal (Hebb, 1955).

This optimum level is obviously different for different people. So, for example, some people seek greater arousal by parachute jumping while others shudder at the prospect of jumping out of a plane and hurtling towards the earth! Motivation to behave, therefore, is induced by sets of positive and negative reinforcers in terms of maintaining this optimum level of arousal. We learn what keeps our own arousal levels at the optimum level.

These theories of motivation fail, however, to account for all the reasons why we engage in behaviour. Biological

FOCUS POINT 27.1

Thirst

Thirst is the psychological experience of the need for water. Satisfying our thirst is an important homeostatic process. There are two kinds of thirst: extracellular thirst and intracellular thirst.

Losing water due to exercise or lack of drinking results in extracellular thirst. Water lost in urine and sweat is extracted from the body by the kidneys, and mostly comes from the water in the blood supply. Reduction of the water levels in the blood results in the loss of blood volume, which in turn signals reduced blood pressure. Under such conditions the brain sends a neural signal to the kidneys that makes them release the hormone renin. Renin reacts with another substance in the blood to produce another hormone called angiotensin. Angiotensin triggers neurones in the brain that produce the desire to drink. So in effect the response of our biological system motivates the desire to drink in order to maintain homeostasis.

Osmosis (the tendency of water to migrate from areas where it is abundant to areas where it is scarce) causes intracellular thirst. As we lose water the concentration of salt levels in the blood rises. This rise in salt concentration of the blood causes water from areas where it is more abundant to move into the blood system. The effect here is the same as when a sponge is placed in a part-filled bowl of water. Neurones in the hypothalamus activate when water is pulled away from them. Such activation results in the experience of thirst. So intracellular thirst does not necessarily have to result from water loss – indeed, eating lots of salty food can have the same effect by raising salt concentration relative to the amount of water in our blood. We need to drink more water to lower that concentration level. Again such a reaction is based on the principles of homeostasis.

theories fail to take into account cognitive influences on what motivates us. Why is it that, for some, money can motivate while for others it is not important? For example, why do some people work as volunteers for no wages and other people seek highly paid jobs? So there must be something else, other than pure biological energy, that motivates different people for different reasons.

Self-test:

- What are instincts? Using examples, suggest how they might influence human behaviour.
- Name and briefly describe the two kinds of thirst.
- How does arousal theory explain human motivation?

The influence of cognition on motivation

How can we explain why some things motivate only some people and why these do not always motivate the same person twice? The contemporary view of motivation emphasises the importance of cognitive processes. How important something is to you and how confident you are in your ability to succeed are cognitive factors that will influence motivation. So, if passing your driving test is essential in gaining that ideal job, you might become too stressed and not perform as well.

Incentive, expectancy and cognitive theories of motivation

The role of incentives

Incentive theory maintains that external stimuli motivate behaviour. Accordingly individuals are attracted to behaviours that offer positive incentives and discouraged from those behaviours that they associate with negative behaviours. Getting a top grade in an exam might act as an incentive for that student to work hard to maintain this level. The value of an incentive is influenced by cognitive and biological factors. So for drug taking behaviour might be motivated by both biological addiction (craving) and cognitive evaluations (taking the drug in the past has made the person feel relaxed and happy). Incentives might also explain some sports motivation. Improving on personal

bests for athletes or triumphing against a rival team for footballers are powerful incentives to perform well.

How do our expectations influence our motivations?

Expectancy theory, developed by Edward Tolman in the 1930s, is based on cognitive processes and motivation here is provided by people's thoughts about engaging in behaviour. Expectancies refer to beliefs about how you will do if you engage in a certain behaviour. So if we expect to do well then we will be more likely to engage in the behaviour. If we feel that the chance of succeeding is poor, we will be less likely to become involved.

The cognitive x value theory states that goal-directed behaviour is motivated by two cognitive judgements: first, the strength of an individual's expectation that engagement in a particular behaviour will lead to goal obtainment (expectation value); second, the value that the individual places on the goal (incentive value). Let us consider an example concerning successful job promotion. Paul studies hard for his upcoming promotion interview, as he believes that this will increase the probability of getting promoted (high expectation value) and he really wants to develop his career with this company (high incentive value). Paul is therefore highly motivated to study for his interview.

Rachel believes studying hard for the promotion interview will lead to greater interview performance (high expectation value) but is not completely sure she wants a long-term job with this company (low incentive value). Rachel is therefore moderately motivated to study for her interview.

Sam thinks performance in an interview is down to luck and holds little value in studying for it (low expectation value) and he is also not particularly bothered about staying with this company (low incentive value). Sam is therefore not particularly motivated to study for his interview. (See Applications box 27.1 for another example of this.)

APPLICATIONS BOX 27.1

Hunger

There are a number of social and biological mechanisms underlying hunger (the state of wanting to eat) and satiety (the state of no longer wanting food). From a biological perspective (as noted in Chapter 9), there are two sets of signals that are associated with hunger. Empty stomachs might increase appetite and produce hunger 'pangs' and a full stomach usually results in a decrease in appetite through bloating. Yet it has been found that people who have had their stomachs removed still get hungry and eat normal levels of food. If the stomach does not seem to signal food satiation, what does?

More precise signals probably come from the brain and its monitoring of blood-borne nutrients such as glucose (sugar used by body cells), amino acids and fatty acids. When glucose levels drop, eating increases. Even animals that have been deprived of food for long periods will not eat again if injected with large doses of glucose.

Hormones also play a role in satiety. High levels of leptin, a hormone produced by fat cells, send signals directly to the hypothalamus to indicate satiety. It has been seen that animals that do not produce leptin (due to natural abnormalities) are often obese.

There are also non-biological signals for eating. Appetite is the motivation to seek pleasure from food. Take chocolate craving as an example. It has been shown that if people who crave chocolate are given substances that taste like chocolate but do not have the same chemical composition as real chocolate, their craving is satiated. However, if people who crave chocolate are given substances that have the same chemical composition as chocolate but do not taste like it, they go on craving chocolate (Michener and Rozin, 1994). This suggests that flavour also acts as a motivational force in some kinds of eating.

It has also been shown that our social environment can influence our eating. People tend to eat more when they are with others. However, individuals who are concerned with how they look to others consume more food when eating on their own than when eating with others. This suggests that social cues can also act to influence our eating habits.

Photo 27.2

Heckhausen's expectancy-value model (1991)
Heckhausen (1991) attempted to integrate a number of different approaches to motivation. The resulting model distinguished between four different types of expectancy: situation outcome (subjective probability of attaining an outcome in a specific situation without acting), action outcome (subjective probability of attaining an outcome by one's actions), action-by-situation outcome (subjective probability that situational factors facilitate or impede one's action-outcome expectancy), and outcome consequence (subjective probability of an outcome to be associated with a specific consequence).

It is important to note that in Heckhausen's model outcomes are the immediate results of one's actions. These immediate results are or are not followed by various consequences (e.g. self-evaluation, external evaluation). They do not have any incentive value on their own. Incentive value is only attributed to the consequences of one's actions. Therefore, the motivation to act depends mainly on the value attached to the consequences of one's behaviour.

The role of self-efficacy

Another model of the cognitive basis of motivation has been suggested by Bandura (1997). Bandura proposed a social cognitive model of motivation focused on the role of perceptions of efficacy and human agency. Bandura defined self-efficacy as an individual's confidence in their ability to organise and execute a given course of action to solve a problem or accomplish a task. He distinguishes between two kinds of expectancy beliefs. First, *outcome expectations*, which are beliefs that certain behaviours will lead to certain outcomes (e.g. the belief that practising will improve one's performance). Second, *efficacy expectations*, which are the beliefs about whether one can effectively perform the behaviours necessary to produce the outcome (e.g. 'I can practise sufficiently hard to pass my driving test'). These two kinds of expectancy belief are different because individuals can believe that a certain behaviour will produce a certain outcome (outcome expectation), but may not believe they can perform that behaviour (efficacy expectation). So, for example, an individual might believe that a good presentation will impress their boss (outcome expectation), but judge that they get very anxious about public speaking and so probably cannot give a good presentation (efficacy expectation). The self-efficacy construct has been applied to behaviour in many domains including school (how well children think they will do in exams), health (patients' ratings of their chances of recovery), sports (athletes' ratings of winning a race), therapy (individuals' judgements on self-improval) and even snake phobia (a phobic's attitude towards success of beating the phobia). For example, St Charles (2002) reported a significant correlation between self-reported self-efficacy scores of lecturers and their subsequent teaching performance. Those academics who reported high self-efficacy in being able to teach were those rated as the best teachers. This study, therefore, strongly suggested that motivation to teach was influenced by self-efficacy. D'Amico and Cardaci (2003) investigated self-efficacy and scholastic achievement as measured in 151 schoolchildren (mean age 13.4 years). They reported that all self-efficacy scores were significantly correlated with scholastic achievement. Therefore, studies such as these seem to suggest that judgements of self-efficacy do have an impact on motivation levels.

How we try to explain the world and motivation

Attribution models include beliefs about ability and expectancies for success, along with incentives for engaging in different activities, including valuing of achievement. Attribution theory proposes that every individual tries to explain success or failure of self and others by offering certain 'attributions'. So running for the bus to work in the morning and missing it we could make a number of attributions regarding our failure to catch it. We might attribute our failure due to the fact that we got up late or we might judge that the driver was being unreasonable and did not wait for us. Different attributions lead to different outcomes in terms of our attitude towards an event. So attributing getting up too late will lead to our being cross with ourselves, while attributing our failure to the bus driver's impatience will make us cross with him/her.

Weiner's attribution theory has been a major theory of motivation for the past 30 years (Weiner, 1985). Weiner (1992) identified ability, effort, task difficulty and luck as the most important achievement attributions that serve to motivate action. He classified these attributions into three factors: locus of control, stability and controllability. The locus of control dimension has two poles: internal versus external locus of control. The stability dimension refers to whether causes change over time or not. Controllability contrasts causes one can control (such as skill/efficacy) from causes one cannot control (e.g. mood, climate, others' actions and luck).

Table 27.1 shows the four attributions that result from a combination of internal or external locus of control and whether or not control is possible when faced with a maths exam.

Weiner and his colleagues (Weiner, 1985, 1992) demonstrated that each of these causal dimensions has unique influences on various aspects of achievement behaviour. Stability influences individuals' expectancies for success: attributing an outcome to a stable cause such as ability or skill has a stronger influence on expectancies for future success (producing greater motivation to engage in action) than attributing an outcome to an unstable cause such as effort. So, for example, we try some things but often give up on them quickly as we soon realise that while we might be able to expend effort, we do not possess the skill (playing a musical instrument, for example). The locus of control factor is linked most strongly to affective reactions.

TABLE 27.1 THE FOUR ATTRIBUTIONS THAT RESULT FROM A COMBINATION OF INTERNAL OR EXTERNAL LOCUS OF CONTROL

	Internal locus of control	External locus of control
No control	Own natural ability with maths	Pure luck (how I am feeling on the day, if I get a lucky break with getting the right questions)
Control	The amount of effort I put into studying maths	Task difficulty (how hard the questions are going to be)

For instance, attributing success to an internal cause enhances one's pride or self-esteem, but attributing that success to an external cause enhances one's gratitude. So we might want to do well in an exam. We could cheat and pass, but we would attribute that pass to dishonesty rather than our own ability. If we studied hard and passed then we would feel proud of ourselves for achieving that goal. As another example, attributional processes have also been shown to play an important motivating role in the rehabilitation of criminals with drug habits. In accord with the model, motivation has been found to affect engagement in treatment, a variable that includes attendance, cooperation and dependability (Hiller et al., 1999). Cognitive strategies designed to improve motivation have been shown to lead to increased engagement in treatment, including commitment to treatment and the strength of the therapeutic relationship between client and counsellor (Simpson et al., 1997).

The role of goals as a motivating force

Goal theories assume that all actions are given meaning, direction and purpose by the goals that individuals seek out, and that the quality and intensity of behaviour will change as these goals change.

The work on goal theory (Ames, 1992; Urdan and Maehr, 1995) has differentiated three separate types of goal:

1. mastery goals (also called learning goals) which focus on gaining competence or mastering a new set of knowledge or skills
2. performance goals (also called ego-involvement goals) which focus on achieving normative-based standards, doing better than others or doing well without a lot of effort;
3. social goals which focus on relationships among people.

Further research has suggested the existence of other goals. For example, Nicholls et al. (1990) defined two major kinds of motivationally relevant goal pattern or orientation: *ego-involved* goals and *task-involved* goals. Individuals with ego-involved goals seek to maximise favourable evaluations of their competence and minimise negative evaluations of competence. Questions such as 'Will I look intelligent?' and 'Can I outperform others?' reflect ego-involved goals. Motivation here is provided by the perception that engagement in the behaviour will enhance one's ego. In contrast, with task-involved goals, individuals focus on mastering tasks and increasing their competence. Questions such as 'How can I do this task?' and 'What will I learn?' reflect task-involved goals. Here individuals perceive that engaging in the behaviour will aid learning and skill competence.

Much of the development of goal-setting theory has been carried out in connection with motivation in sports, business, education and health. For example, Locke and Latham (1985) reported that goals affected sports performance by affecting effort, persistence and attention and by motivating strategy development. Fisher and Hardie (2002) examined the value of goal attainment scaling (GAS) as a therapeutic tool and an outcome measure in a rehabilitation programme in the management of chronic pain. The GAS measures individuals' likelihood of attaining a specific goal. One hundred and forty-nine patients (mean age 42.5 years) with chronic pain completed a 15-day pain management programme, day case or residential, in an NHS regional rehabilitation centre. Goal theory correlated significantly with walking improvement and pain experience. For example, Dowson and McInerney (2001) found a positive relationship between students' social goals and effective engagement in learning. Students' concerns about fitting in with others, social affiliations and social responsibilities were the most salient academic motivators and directly influenced students' academic achievements.

Self-test:

- What role do incentives play as a motivating force?
- Briefly explain why we feel hungry.
- According to Bandura, what is self-efficacy?
- What are the two types of locus of control and how do they influence motivation?
- What are the three main types of goal that might motivate people?

The need for self-development

Some psychologists believe that our desire to better ourselves and improve our skills and situation in the world are the strongest factors that motivate our behaviour.

Humanistic theory provides one of the most well-known accounts of motivation. According to this view, humans are driven to achieve their maximum potential and will always do so unless obstacles are placed in their way. These obstacles include hunger, thirst, financial problems, safety issues or anything else that takes our focus away from maximum psychological growth. According to Maslow's (1970) hierarchy of needs, we are motivated to seek basic needs such as food and shelter and move up to higher psychological needs.

Maslow's work has led to additional attempts to develop a grand overarching theory of motivation. For example, Leonard et al. (1995) propose five factors as the sources of motivation:

1. instrumental motivation (rewards and punishers)
2. intrinsic process motivation (enjoyment, fun)
3. goal internalisation (self-determined values and goals)
4. internal self-concept-based motivation (matching behaviour with internally developed ideal self)
5. external self-concept-based motivation (matching behaviour with externally developed ideal self).

So their model has two sources of motivation – internally driven motivation and externally driven. Factors one and five are both externally oriented. The main difference is that individuals who are instrumentally motivated are influenced more by immediate actions in the environment (e.g. operant conditioning) whereas individuals who are self-concept motivated are influenced more by their constructions of external demands and ideals (e.g. social cognition). Factors two, three and four are more internally oriented. In the case of intrinsic processes, the specific task is interesting and provides immediate internal reinforcement (e.g. cognitive or humanistic theory). The individual with a goal-internalisation orientation is more task oriented (e.g. humanistic or social cognition theory) whereas the person with an internal self-concept orientation is more influenced by individual constructions of the ideal self (humanistic or psychoanalytic theory) (see Applications box 27.2).

What is the difference between intrinsic and extrinsic motivation?

From the review of motivational theories, it can be seen that there are generally speaking two different kinds of motivational factor: those that are internally generated and those that are externally generated. These are called intrinsic motivation and extrinsic motivation respectively (see Table 27.2). Examples of intrinsic motivation are feeling good about doing something (ego boosts), gaining knowledge or competence as a result of engaging in a behaviour. In contrast, examples of extrinsic motivation include money, materialistic gains (new car, bigger office, more friends) and basically engaging in a task merely to obtain rewards or avoid punishments from sources outside oneself. When people pursue activities for their intrinsic interest, they are especially likely to become and remain fascinated and absorbed by them and feel happy. Conversely, when people concentrate on the external rewards of particular tasks, they experience decreased emotional involvement and more negative feelings. Hence, intrinsic motivational factors seem to motivate us for longer periods of time. Previous findings have shown that students who are intrinsically motivated persist longer, conquer more challenges and demonstrate greater accomplishments in their academic endeavours than those who are extrinsically motivated (Ames, 1992).

Twemlow et al. (1996) researched why people (170 martial arts students, ranging from age 5 to 63) studied

APPLICATIONS BOX 27.2

Theories in focus

There is an impressive body of research showing the relationship of expectancy, attributions and values to different kinds of performance, and it supports the continuing viability of these models. However, expectancy theory, attribution theory, goal theory and self-efficacy theory can all be criticised for emphasising the rational cognitive processes leading to motivation and behaviour.

Fischhoff et al. (1982), for example, argued that individuals do not realistically engage in the logical, rational decision-making processes of determining expectancies and values. They found that people prefer more fallible and optimistic decision-making strategies in terms of motivating them to act.

Goal theory has also been criticised in one area, namely that it leaves largely unaddressed the question of why individuals choose one goal over another. The humanistic approaches to motivation, while interesting, are somewhat rigid. Maslow's contention that we must first satisfy basic needs prior to attending to higher needs is not reflected in daily life. For example, someone who is dieting may be hungry but is more motivated by how the diet will make them look than by satisfying their hunger.

TABLE 27.2 TWO CATEGORIES OF MOTIVATION: INTRINSIC AND EXTRINSIC

Intrinsic	Extrinsic
■ Explain or show why learning a particular content or skill is important ■ Create and/or maintain curiosity and interest ■ Provide a variety of activities and sensory stimulations: reading, stories, video ■ Provide games and simulations ■ Set clear goals for learning ■ Relate learning to student needs and examples from their daily lives ■ Help student develop plan of action	■ Provide clear expectations ■ Give corrective feedback ■ Provide valuable rewards ■ Make rewards available

martial arts. Responses supported the view that both intrinsic and extrinsic factors motivate people – *physical and recreational* (extrinsic motivation) needs such as self-defence, the need for physical exercise or the experience of competing; *intellectual and emotional* (intrinsic motivation) needs such as self-discipline and self-confidence.

One also has to distinguish between immediate reasons (e.g. enjoyment) and ultimate reasons of behaviour (e.g. survival). Intrinsically motivated behaviour can be conducive to ultimate goals even though the individual is only motivated by immediate incentives. A typical case is exploratory or play behaviour. Play helps to increase an individual's competence, but it is also performed because play is exciting, pleasurable or enjoyable (see Applications box 27.3).

APPLICATIONS BOX 27.3

Increasing motivation in the classroom using intrinsic and extrinsic factors

There is a variety of specific actions that teachers can take to increase motivation in classroom tasks. In general, these fall into the two categories, intrinsic motivation and extrinsic motivation, as shown in Table 27.2.

Other motivational forces

Sexual motivation

There is a difference between sexual motivation and the hunger and thirst motivation drives. When a hungry or thirsty animal ingests a sufficient quantity of food or water, this restoration of energy or fluid returns the organism to a state of homeostatic balance. Sexual activity, however, depletes the organism's energy stores and the sex drive is satiated only when fatigue and exhaustion override it. Additional important differences arise because sexual motivation is largely elicited by environmental cues, whereas hunger and thirst reflect internal changes.

As you have seen in the biological chapters, sex hormones released by the brain play an activating role in sexual behaviour (see Section 2). While both males and females have both types of sex hormones, estrogens and progestins are the female sex hormones and androgens are the male sex hormone. Females obviously have greater amounts of estrogens and progestins and males greater levels of androgens.

Despite the fact that sexual behaviour in humans is controlled and driven by our brain, at the same time it is strongly influenced by learned experience from interaction with our environment. This being the case, social, ethnic and cultural experience also regulate our sexual preference

FOCUS POINT 27.2

Cross-dressing or transvestism

Let's look at the motivational factors responsible for transvestism, or cross-dressing. For every 100 male cross-dressers there will probably be only one female cross-dresser. The major difference between male and female transvestites is the underlying motivation for cross-dressing. Whereas male cross-dressing is generally associated with fetishism (sexual arousal elicited by an inanimate object such as lingerie or shoes), this is not the case for female cross-dressers. For female transvestites there tends to be little or no erotic component to cross-dressing. Instead, their cross-dressing seems to emanate from a desire to embrace and experience male power and status, and what is perceived to be male privilege.

Thus these two sets of cross-dressers have acquired such behaviour through different associated learning patterns, which result in differing motivations.

and habits. Learning must be an important factor in sexual motivation because what is considered ‘normal’ and ‘abnormal’ in human sexual behaviour is highly variable across cultures and times. Sexual motivation is therefore a unique blend of physiological and psychological stimulation (see Focus point 27.2).

Sensation seeking

Many individuals seek out stimulation, which as we have said runs contrary to the drive-reduction goal theories (see Definition box 27.4).

DEFINITION BOX 27.4

Sensation seeking is the motivation to seek out stimulation and novelty.

Sensation seekers seem less reactive to stimulation and therefore require stronger levels of it than low sensation seekers (Zuckerman, 1991). So people who have high sensation seeking tend to be motivated to engage in more risky behaviour, more high-risk jobs (firefighting, pilots) and more extreme sports (Jack and Ronan, 1998). Slanger and Rudestam (1997) investigated the role of sensation seeking as a source of motivating people to partake in extreme sports using Zuckerman’s sensation-seeking scale (1974). Results indicated that the extreme sport participants were in fact seeking the highest levels of sensation and self-efficacy. Researchers discovered that in terms of intrinsic motivation, participants’ desire for mastery of their sports allowed them to overcome the fear of imminent injury and even death. Those who scored as low risk takers were more interested in the safer, aesthetic aspects of their sport. High sensation seekers are also more likely to engage in illegal activities (Slobodian and Browne, 2001) and engage in a wider range of sexual activities with a greater number of partners (McCoul and Haslam, 2001). They also expressed a greater liking for ‘unpleasant’ paintings and photographs than did low sensation seekers (Rawlings, 1993). It has also been shown that high sensation seekers within the security forces are those most likely to engage in bomb-disposal work (Glicksohn and Bozna, 2000)!

Achievement motivation

The need for achievement is the desire to accomplish tasks, achieve goals and excel. David McClelland et al. (1953) and John Atkinson (1981) have contributed greatly to this area of study. There may be two reasons people strive to succeed: motivation for success and fear of failure. The motive of success reflects intrinsic motivational forces, the desire to master skills or goals. Success motivation develops when parents reward success and achievement but do not punish failure (Koestner and McClelland, 1990). Fear of failure produces motivation that drives us to outperform peers. Such motivation is not always conducive to better performance. Indeed, it has been shown that individuals who have high fear of failure attitudes are also very anxious. Such anxiety produces stress and stress, as we have seen elsewhere in this book, interferes with effective cognitive functioning (such as concentration, attention and memory). It has been shown that fear of failure seems to develop in children whose parents take for granted success but punish failure (Weiner, 1992).

There are four characteristics of strong need for achievement motives:

- Preoccupation with their own performance.
- The tendency to struggle with tasks rather than seek help.
- Plan more.
- Prefer honest, no-nonsense feedback from competent critics.

Borucki (1985) studied the role of the need for professional achievement in perceived organisational stress in 107 male junior managers in Gdansk, Poland. The need for achievement was examined in its effect on stress levels for perceived role conflict, role overload and role ambiguity (a job that is poorly defined in terms of what it entails). High need for achievement diminished experience of negative emotions and perceived stress within role conflict and role overload situations. Borucki (1985) reported that the need for professional achievement appears to be a significant determinant of resistance to organisational stress in relation to job roles.

Self-test:

- What is the difference between intrinsic and extrinsic motivation? Give an example of each type.
- What characteristics are associated with a strong need for achievement?

Summary

Motivation is an internal state experienced by individuals. Motivation is engaged in by choice or intention. Some theorists see motivation as a psychological force by which we achieve goals; others see it as a tool to fulfil our needs. There are two different motivational forces: intrinsic motivational factors and extrinsic motivational factors. Motivational research has been applied in such settings as health behaviour, criminal activity and work performance.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the major theories of motivation.
2. Distinguish between intrinsic and extrinsic motivation.
3. Describe motivational forces such as sexual motivation, sensation seeking and need for achievement.
4. Use examples of where motivational research has been applied in other areas of psychology.

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The psychology of the self

Route map of the chapter

This chapter is divided into several sections. The first begins with a section on what we understand by the concept of self, its function and how it develops. We will then focus on how we gather and organise information about ourselves from both our own behaviour and how we are treated by others around us. We will also describe some of the strategies that we deploy as defence mechanisms when the concept of our identity comes under threat. We will then consider how the social groups to which we belong and how the role of culture also play a vital part in the understanding of who we are. Lastly, we will discuss what happens when we lose our way and become confused about who we are and what we represent.

What is the self?

The self encompasses such things as our conscious thoughts of our uniqueness from others and, of course, our similarities to them. Higgins (1999) suggests that the self is divided up into two parts: the ideal self (what individuals would like to be) and the ought self (an understanding of what others want us to be). Stainton Rogers (2003) suggests that we have three 'selfs': a personal self (the me that is conscious of my own thoughts and feelings), a social self (the me defined by whichever social context I am in) and, lastly, a relational self (the me that comes from interconnected relationships with others around me).

Functions of selfhood

The self is an interpersonal tool. Having some form of identity is a prerequisite for social life and human interaction. To hold a conversation requires understandings of 'you' and 'I'. To maintain a long-term relationship requires the identities of the two people involved to remain stable over time.

People generally strive to have traits that will support these interpersonal relationships. We are particularly concerned with how other people will perceive ourselves. The self organises this feedback from others and also buffers us against negative feedback.

It allows us to make choices. The self typically comes to have a collection of values, preferences and priorities that can be evoked whenever we need to make a decision (see Definition box 28.1).

The self organises our thoughts, feelings and actions and is the primary centre of our personalities. It reflects our

SOCIAL ID : FANCY DRESS SHOP

DEFINITION BOX 28.1

The self

Sedikides (1992: 273) defines the self thus: 'A person's self is the person's mental representation of information pertaining to him or her.'

hopes, dreams and plans. Lewis (2003) argues that the self also acts as our moraliser. Thus we are able to reflect on the past, consider the future, develop ideas about ourselves, consider what others think about us and decide how we would like to be seen by other people. Only a very few closely related species (chimpanzees and orang-utans) have our developed capacity for self-recognition and these are not as sophisticated as ours are. This ability is called self-concept. Self-concept reflects our sense of our own identity and our individual worth. The concept of self has been used by psychologists and philosophers as a way of describing the core of our personalities, our central motivations in life and our higher cognitive functioning. Self-concept has also been shown to be influential in guiding behaviour. For example, Corte (2003) showed that an impoverished self-concept contributes to negative affect and can lead to high levels of alcohol use and this might be one factor in explaining alcohol addiction. Similarly, Mizell and Andre (2003) propose that a child's self-concept mediates the effects of inter-parental discord on subsequent bullying behaviour.

Development of the self

We start to develop a sense of who we are from an early age (see Table 28.1). Infants as young as 15 months appear to recognise themselves in a mirror – studies have shown that they become startled when a red line has been placed on their noses and they look back into the mirror (Butterworth, 1992). At about 18 months we gain the knowledge that we exist as individuals separate from anyone else. The self develops largely through 'social identity'. For every individual, our social identity is crucial in defining who we are, what we do and how we evaluate ourselves.

An individuals, our social identity stems from our *personality*, our *self-concept* and the *roles* we undertake. We acquire each of these three elements of social identity through social interactions of the various groupings of people with which we identify (groups such as race, religion, sex type, political affiliation, age and occupation) (see Activity box 28.1).

As we go through life, we each acquire information about ourselves from how others react to us and this information develops our appraisal of our 'self'. This can be from direct social comparison with others (students do this with coursework when the results come out, each wanting to know how they have done in comparison with other students). It can also be from observing our own behaviour

ACTIVITY BOX 28.1

Who are you?

Take a clean sheet of paper and give yourself 5 minutes to write down and describe who you are.

Finished? So how did you describe yourself? Out of all the things you are and you think you represent, what did you give priority to in your self?

The information you chose to write down in this activity is called your spontaneous self-concept. For some, 5 minutes will be little time to do descriptive justice to who you think you are, while for others 5 minutes talking about themselves was a daunting challenge.

It doesn't take long to form an impression of someone else we meet for the first time, probably around 60 seconds, but those 60 seconds form the basis of what that other person sees as our 'self' and will influence future behaviour towards us. So think very carefully about what you say and how you say it. Even how we present ourselves can provide useful information to others of who they think we are. To be honest most of the people we encounter, meet and bump into get less than 1 minute to form an impression of us. Think about that next time you decide to venture out into the big world.

TABLE 28.1 DEVELOPMENT OF THE SELF

Age	How the self is manifested
3–4 years	Children describe themselves in terms of their favourite activity or the behaviours they often engage in; so 'I watch TV', 'I do painting' are examples of how children here might describe themselves
8–9 years	Children at this age tend to describe who they are in terms of their age, name, and what they like and dislike; they still describe things that they do but now also start to describe how good they are at them compared with other children they know
11 years	Children describe themselves in terms of their relationships with others; so they might say they are 'sporty' or 'smart'
Adolescence	Descriptions of ethnic and national identity seem to be the final stage in the development of the self

which is called self-perception. There are times when we become self-conscious and scrutinise our own behaviour. A good example of this is being on a first date. We start to ask ourselves questions by self-observing our behaviour. For example, should I have worn that jumper that Granny knitted me? Do I sound interesting, yet cool and sexy at the same time? Will my date like me compared with other dates they have been on? Hirsch et al. (2003) reported that when social phobic participants held a negative self-image in their mind they experienced greater anxiety, rated their anxiety symptoms as being more visible and rated their performance as poorer than those people who were not told to imagine a negative self-image. The researchers suggested that holding negative self-concept images has a causal role in maintaining social phobias.

The importance of self-presentation

The way we present ourselves is important to maintaining both our own awareness of who we are and that of the people we are with. The good news is that we are all assigned our own PR agent in life who is free! The bad news for many of us is that it is ourselves! Self-presentation is the conscious effort to control the impression we make to others in an effort to maintain our self identity (see Activity box 28.2).

Erving Goffman (1959) suggested that self-presentation is important in maintaining self-image to others. It is a tool that we use to maintain ego and self-esteem. He likened the engagement of self-presentation to that of preparing to act in a play:

- We pay special attention to our *appearance*. (Many of you probably do not make such an effort with how you look if you know you are not going to venture out, and some of you spend more time getting ready than you do actually being out!)
- We use *props* to further our self-presentation image. (We might wear glasses when at home with the family or contact lenses when out with friends.)
- We often set the *stage*. (We might take a date to a specific club or restaurant to create an impression.)
- We often *rehearse*. (Just before making a phone call many people rehearse what they are going to say; some individuals prepare mock interviews with friends prior to the real thing.)
- Much of the preparation for our performances takes place *backstage*. (We might slave away over a meal the entire day laying waste to our best saucepan set and persuading the fire brigade it wasn't a full-scale kitchen fire, only a bit of smoke.)
- The backstage preparation leads to our *frontstage* performance. (So that when our dinner guests turn up and exclaim their delight at your culinary skills you simply reply 'oh it's just a little something I threw together'.)

But none of these would be meaningful if we didn't have an audience to play to. So, paradoxically, the development of the self through the process of social identity is reliant on experience with others. Without the presence of others with whom we might compare ourselves and learn from, we would be impeded perhaps in the development of a sense of who and what we are. The funny thing is that we seem to be more worried about what people think about us than they do themselves. Gilovich et al. (2002) have suggested that people around us are more *unaware* of the variability of our appearances and behaviour than we actually give them credit for.

ACTIVITY BOX 28.2

What are you wearing?

Let's have a look at what you are wearing. Some of you reading this will be embarrassed about what you are wearing and, quite frankly, some of you who are not should be! If you had known we would be scrutinising what you are wearing you'd have tried harder. Some of you would have tried harder but it would have made no difference.

The point here is that even our clothes are props in the presentation to the world of who we are. We would probably dress differently for a job interview than we would going out to the pictures with friends. We are the same person inside, so why change our clothes? What difference does it make? Well it must make some difference or else fashion would be redundant and you would have no need for a clothes collection.

We make different statements about who we are with different people and in different circumstances.

Self-test:

- Stainton Rogers (2003) suggests that we have three 'selfs'. What are they?
- What are the three functions of 'selfhood'?
- Describe how Erving Goffman saw the engagement of self-presentation to that of preparing to act in a play.

How is the information we hold about ourselves organised?

An individual's self-schema organises memories about the self and also controls the processing of self-relevant information. Consider again how you described yourself – those traits that you listed are the traits that are probably central to your own self-schema. These are the core elements of how you view yourself.

Generally people tend to see themselves as having rich, well-developed and adaptable personalities and judge that they are less predictable than other people. Traits that are considered central to one's own self-schema are valued more highly than other characteristics.

For example, students who do well in a subject would probably rate that subject as a more important part of their personality than would those students who got poorer grades. So if you said you are honest, you would probably be very sensitive to other people's honesty. Your self-schema would view that characteristic as being important to you.

Our information, judgements and feelings about ourselves are influenced by many factors. We will now consider how we come to form an impression of our 'self' and who and what we represent.

Factors contributing to knowledge of our 'self'

There are a number of important factors that shape the information we hold about our 'self'. You will probably recognise some of these as you probably engage in them on a daily basis.

Socialisation and group membership

Our treatment by our parents, relatives, teachers, peers and friends can be influential in how we come to view ourselves. Our self-schema organises this feedback and looks for consistencies in how we are treated from both people and situations. The more that different people treat us the same in more different situations, the greater the importance that our self-schema attaches to this information. So if lots of people laughed at us wherever we went our self-schema might formulate that being funny was a core part of who we were (either that or we should upgrade our sense of fashion – and fast!).

This process of information gathering by our self-schema is called reflected appraisal. We appraise the feedback and treatment we get from others around us. Cooley (1902) called this tendency for self-appraisal our *looking glass self*. In other words, everyone around us is a mirror by which we get to see how our own behaviour is received and judged. Mead (1934) described this process as our 'reflexive self' – a self that is able to observe, respond to and plan our own behaviour.

How we are socialised and how we interact with others gives us our sense of social identity. So in many cases the sense of our own identity is closely linked with our various group memberships. Participation in recreational, religious, ethnic, occupational and cultural activities provides us with who we are and where we fit into our society. Since part of our self-identity is derived from group membership and since we strive to keep a positive self-concept of ourselves, we also have a tendency to view the groups we belong to more positively than those groups we do not. This is called social identity theory (Tajfel and Turner, 1986). In essence, people come to identify with social groups and then tend to define themselves as having the characteristics of those groups to which they belong. So, being a smoker or being disabled are examples of groups by which we are judged by the stereotype of that group of people. Such perceptions obviously can lead to misjudgements heralding stereotypes and prejudice (see Class activity box 28.1).

CLASS ACTIVITY BOX 28.1

Make a new friend

Let's see how good your social skills are. Ask someone in the class who you do not know very well to describe themselves to you. Make a note of how they describe themselves to you. Note the different groups they belong to (e.g. family, work, sport) and the different roles that they undertake (e.g. parent, student, worker).

What you will notice, quite paradoxically, is that while you asked them to describe themselves they will usually describe to you how they fit in relation to others around them. For example, 'I am a mother', 'I work as a nurse', 'I come from London'. It is very hard to define ourselves without reference to at least one group membership.

Now swap around and describe yourself to this person.

Reflected appraisal and explicit feedback

Not only do we appraise how others treat and respond to our actions, we also reflect on our own behaviour. Bem (1972), through his theory of self-perception, suggested that we know who we are by observing our own behaviour. So, in an emergency, if you observe yourself acting calmly you may come to think that you are a calm person in a crisis. If you attend church regularly of your own free will then you would conclude you are religious. So just as someone who observes us would infer a reason for our current behaviour, we try to do the same with our own behaviour.

We also tend to have an ego defence system that operates in this judgement of our own behaviour, which is called egocentricity. In judging our own behaviour we tend to rate our contributions as being more important than anyone else's. People who have been asked to rate their own and their work colleagues' relative contributions in solving a task while working in pairs give very different assessments according to when you ask them.

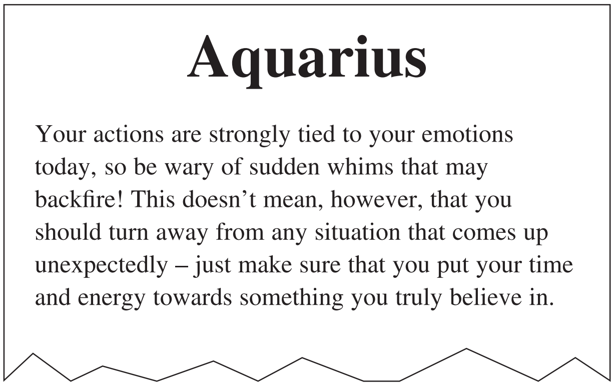
When asked immediately after working in the pair, individuals judge the other person to have contributed more than themselves. However, after a 3-day break, judgements are reversed and they now judge themselves to have been the one in the pair who contributed more.

Direct and explicit feedback by others also informs the development of our self-perception and explicit feedback starts at an early age. Proud parents delight at their children's first steps and words and show disappointment when they do something wrong. The feedback that was directed at us from our teachers also shapes the perception of our 'self'. For example, take a person's skills at chemistry. For many people (including the author), anything more complex than understanding that coffee gets weaker the more milk you add to it and you leave them way behind. This is probably because such individuals were not confident at chemistry while at school and received feedback by both their teachers and their classmates confirming their lack of ability. Our peers also provide targeted feedback. Being picked last for team games in the break at school, constantly being asked by colleagues at work for advice, are examples of direct feedback.

Bias in self-perception

Biases in our self-perception also influence the information we hold about ourselves. These biases help maintain positive self-esteem in the face of disappointment and failure and there are several mechanisms that we engage in to protect our self-image. One is positivity bias, which results in a systematic, positive distortion of memories. Let us say someone is given an intelligence test and then the false impression that their score represented a highly intelligent person. They are then asked to remember how high their grades were at school on average. The chances are that they would falsely predict that they got higher grades than they actually achieved. This is because the recency effect of being informed that they are highly intelligent creates a positive distortion of the memories of their past intellectual ability.

There is also the tendency for people to accept very general or vague characterisations of themselves and take them to be accurate. A good example of this can be seen when people believe what is said about them in psychometric tests, personality profiles and astrological predictions. This is known as the Barnum effect, named after the famous showman P. T. Barnum, who believed that a good circus had 'a little something for everybody'. More recently it has been termed the subjective validation effect. Even though the descriptions we read or which are given to us could apply equally well to other people, some individuals are gullible enough to believe they are unique to themselves. This is exactly what happens with horoscope and palm reading (see Class activity box 28.2).



Aquarius

Your actions are strongly tied to your emotions today, so be wary of sudden whims that may backfire! This doesn't mean, however, that you should turn away from any situation that comes up unexpectedly – just make sure that you put your time and energy towards something you truly believe in.

Figure 28.1 Even though the descriptions we read are sometimes generalised to a group of people, some individuals believe they are unique to them.

CLASS ACTIVITY BOX 28.2

Horoscopes and self-perception

Find a horoscope description of the star sign you belong to. Bring it along to the next class. Rate this description on a scale of 1–10 for how accurate you think it is in describing your personality (with 1 being inaccurate and 10 being most accurate). Now find someone who shares the same star sign and ask them to do the same. Now sit with this person and find out how similar or dissimilar you are to one another.

Compare the scores you each gave the star sign description with your own observations about how similar you are to one another. How might you explain the fact that you both may have similar scores for the star sign description but probably feel you are quite different from your discussion with one another?

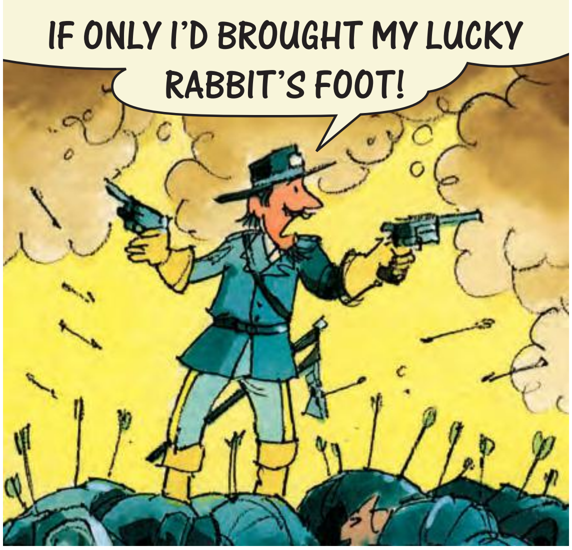
Psychologist B. R. Forer (1949) found that people tend to accept vague and general personality descriptions as uniquely applicable to themselves without realising that the same description could be applied to just about anyone. Forer gave a personality test to his students, ignored their answers and gave each student the identical generally positive descriptive evaluation. He asked them to rate the evaluation from 0 to 5, with '5' meaning the recipient felt the evaluation was an 'excellent' assessment and '4' meaning the assessment was 'good'. The class average evaluation was 4.26. That was in 1948. The test has been repeated many times since and the average is still around 4.2.

Self-test:

- What is social identity theory?
- Using an example describe what 'egocentricity' is.
- What is 'subjective validation effect'? Give an example.

Interpretation of self-relevant information

We are constantly monitoring ourselves and reflecting on the information that we receive about ourselves. This information is also used to shape and update our self-schema. This evaluative process of evaluating 'me' is called self-esteem, and it is therefore our evaluation of our self-concept (Brown and Marshall, 2001). The greater the discrepancy between the actual self, the ideal self and the ought self, the lower our self-esteem will be. Also the more important these attributes are to us, the greater the negative effect on our self-esteem (Boldero and Francis, 2000). This probably sounds alarming to many of you who are reading


IF ONLY I'D BROUGHT MY LUCKY RABBIT'S FOOT!

this, because you may well have the opinion that there is a gap between your actual self and your ideal self. However, we have a couple of tricks up our sleeve to try to limit the effects of despair and disappointment brought on by thoughts of inadequacy and failure.

We actively try to maintain positive self-image. In an attempt to maintain our acceptable self to ourselves we often enhance our self-esteem by interpreting self-relevant information in a biased self-serving manner. The aim of this is to make ourselves feel good by minimising the difference between our actual self and our ideal/ought self (Dunning and Hayes, 1996).

A second defence mechanism is called self-handicapping hurdles (Tice and Baumeister, 1990). These protect positive self-esteem and also help to maintain positive self-image. We have all engaged in this kind of behaviour before. How many of you have used the following excuses: blamed the dog for eating homework? Blamed the room temperature for poor exam performance? Blamed public transport for being late? Self-handicapping hurdles de-emphasise our failings and excuse them away in terms of unexpected or uncontrolled events. They buffer our positive self-image by pretending that we have the ability to succeed but some other 'X' factor not under our control spoiled our chances. We see football managers excusing their teams because they were wearing the wrong colour shirts, public transport officials blaming train delays on the wrong leaves on the line and politicians blaming just about everything else, save themselves.

Students engage in this process when results are published after their examinations. Success in an exam is often put down to intelligence and ability, whereas failure is interpreted as bad luck, poor questions or the bad mood of the examiner when marking their scripts. This is called *self-serving bias* – the tendency to take personal credit for success but to blame failure on external causes. In general, it seems men use more alcohol/drug/external excuses while women tend to use more stress or physical illness-related excuses.

We also know that culture can influence self-esteem. Tashakkori (1993) has reported that for white students, physical appearance was closely related to self-esteem, for Afro-Caribbean boys it was power and Afro-Caribbean girls it was popularity. So the basis for self-esteem can be different for different groups and cultures of people, just as it can be from one individual to the next.

Self-test: Using an example, describe what 'self-handicapping hurdles' are.

Social comparisons

How do you know how intelligent you are? How funny can you be? How patient are you? Another source of information that shapes the development of our 'self' is that of comparing with others around us. *Social comparison* is when we evaluate our own accomplishments by comparing them with those around us. Our self-esteem suffers if others are judged to outperform us (Kulik and Gump, 1997). If we lived on a desert island and we engaged in activities such as coconut shaving and grass skirt weaving, how would we know how good we were at these skills? We might be able to shave a coconut but is there someone else in the world who could do it faster? We need other individuals to compare how you stand in relation to them. Better? Worse? The same?

We also tend to look to others most when we find ourselves in a novel situation. We look around us to see if someone near us has the answers or the skills that are needed in this new situation. So you find yourself on the middle of the dance floor on a Friday night in the wee small hours strutting your stuff and generally getting on down. Suddenly without warning the DJ slaps on a new tune. It's one you haven't had a chance to practise in your room. Your legs freeze and your arms suddenly fall by your side losing all animation. Panic. What do you do? Walk away defeated, blocking out the sneers and jeers of all the other disco divas or lock on to someone who is in the middle of their finely choreographed dance number and copy them? This is a perfect example of using others around you to learn when faced by novelty. A good example of this is crossing a busy road you may be unfamiliar with. Faced with this task many people refer to other people around them in deciding when or where to cross the road.

Maintaining positive self-image with others

We also have a number of ways that we can preserve our self-esteem when comparing ourselves to others. These techniques are known as self-enhancement strategies and are aimed at seeking positive information about ourselves or interpreting ambiguous information in the most favourable light to maintain our self-esteem (Sedikides, 1993). These strategies enable us to maintain a positive impression of ourselves through reference to others around us. An example is to compare yourself with those who are less capable than yourself. This has been termed downward comparison (Lockwood, 2002). However, only people with low self-esteem will benefit from downward comparison. So the next time your friend beats you at tennis, give your 101-year-old granny a call and book a court. Another way to try to recover lost self-esteem through social comparison is to exaggerate the ability of those who outperform you. By making out that the person who beat you is, in actual fact, superman/woman you can still perceive yourself as being at least good or above average. A third strategy that works is to change your belief in the task at hand so that it no longer is important to your self-concept (Pilkington and Smith, 2000). So that degree in figure skating you failed recently despite breaking every bone in your body twice and taking 8 years to complete it, wasn't really that important to you – it was just a hobby!

The role of culture

What role does culture play in the development of who we understand ourselves to be? Our culture provides another form of social comparison. Cousins (1989) employed a questionnaire (called the 20 statements test) to investigate how the concept of 'self' is viewed across different cultures. He tested students in America and Japan. He found that American students tend to have a more individualistic sense of self, while Japanese students in contrast have more of a sense of a relational self. This would therefore seem to suggest that not only do individuals have different concepts of 'self' but that cultures are also influential in developing our self-concepts.

One major difference in world culture is that of the collectivist identity versus individualist identity. Individualist cultures tend to promote the drive for personal control, independence and individual achievement and individualistic values tend to be associated with the western world. People who move countries from individualistic cultures show more concern for establishing a career and gaining achievement than they do for establishing relationships and maintaining family ties (Boneva and Frieze, 2001). In contrast, the collectivist gives priority to the aims of the group (family, clan or company). These group principles bring a sense of belonging, a set of understood and shared values and a secure environment. Collectivist societies are associated more with oriental cultures. For example it has been shown that in Korea, people place more emphasis on cultural tradition and shared practices and give less value to promoting a unique self-concept (Choi and Choi, 2002). There is also evidence that illustrates the powerful impact of collectivist cultural identities on an individual's self-concept. Examples of collectivist culture and self-sacrifice are activists (such as animal and environmental rights activists) and, in the extreme, the suicide bomber (Drury and Reicher, 2000). In each case, the individual sacrifices their personal self for the good of the collective self.

The role of social norms

Our societies and cultures also help shape our self-concept with the production of social norms (see Definition box 28.2).

DEFINITION BOX 28.2

Social norms

A norm is an understood, but not legally binding, rule for determining which behaviour is acceptable and expected. Norms provide guides for proper and appropriate behaviour.

Each cultural group will evolve its own norms for behaviour among its group members. So the British norm of orderly queuing for a bus runs in stark contrast to the chaotic free for all in some other countries. Knowing what cutlery to use first at a wedding reception or giving up your seat for an elderly person are all examples of social norms. Shaking someone's hand or kissing them in greeting will be decided by the norm of the group you belong to. These unwritten rules are absorbed by our self-concept and become part of our 'self'.

Identity crises: challenges to identity

We have considered the factors that contribute to who you and others think you are, but what happens when your identity is challenged? People change jobs, sometimes quite dramatically (banker to teacher), go from being single to married and vice versa and face the challenge of new identities – parent, aunt or uncle and grandparent. Baumeister (1997) has suggested two distinct forms of personality crises: identity conflict and identity deficit.

Photo 28.1 Cultural identity also serves as an important informer of who we are and what we represent.

Identity conflict arises when we are faced by aspects of our identity that are incompatible. Strong examples of identity conflict are seen in some women who want a family but also want a career. Refugees who seek new lives in new countries away from persecution also face a crisis as they face the challenge of assuming a new cultural identity while trying to keep some of their former cultural identity. Such conflicts often result in anxiety, stress and feelings of guilt and can have a significant impact on welfare and mental health.

Identity crises, by way of contrast, arise when an individual does not have an adequately formed or stable identity. This unstable identity is further threatened by facing major decisions. Many people can make an important decision straight away as they know their own values and are aware of their own preferences. For other people, their insecure sense of who they are and their skills and abilities makes the decision harder. For example, attending university. Faced with this decision some individuals will question their intellectual capacity to successfully complete a degree, others might question whether further study is right for them and others might wonder what course to do which might suit them. Individuals who do not have established or clear personal identities can also be more vulnerable to propaganda and persuasion by others. They are curious about others who seem to 'know who they are' and impressed by others who seem to know what they are doing. People with identity deficits are probably more susceptible to the recruitment strategies of cults and extreme groups (Singer and Lalich, 1995).

Self-test:

- Give an example of how a 'self-enhancement strategy' might preserve our self-esteem
- What is the main difference between 'collectivist identity' and 'individualist identity'?
- Define what is meant by 'social norm' and give an example of one.
- What is 'identity conflict'. Give an example of how it might arise.

Summary

The self is a cognitive representation of who we are. It informs us where we stand in relation to others and acts as a tool for directing our interpersonal relationships. It allows us to make choices in our behaviour. Our self develops through interaction with others and is influenced by how others treat us. We constantly self-evaluate and this process forms the basis of self-esteem.

Learning outcomes

When you have completed this chapter, you should able to:

1. Describe what is meant by 'self' and what its functions are.
2. Describe how the perception of self develops.
3. Appreciate how our self-concept is influenced and shaped by social factors (such as society and culture).
4. Describe the mechanisms that we employ to maintain a positive self-image.
5. Describe what is meant by identity crisis and how this might arise.

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Personality and intelligence

29

Personality

Route map of the chapter

This chapter discusses the psychological factors that contribute to our personalities. We will consider several important questions about the nature and development of your personality characteristics in relation to the main theoretical paradigms in this field. Consideration will be given to environmental, cognitive and biological factors that contribute to the shaping of our personalities. We will also investigate personality in terms of gender difference, stability over the lifespan and the influence of motivational forces on it.

Definitions of personality

These questions are those that psychologists have been looking for answers to in trying to understand what personality is.

Scientists have only explored the notion of personality systematically since the 1930s. This represents a relatively short period of time in terms of scientific study. As such, psychologists are still finding their way in this area. So to some extent we are still struggling to identify the questions and issues that need to be addressed if we are to fully understand what personality is. We have, however, made some inroads in our understanding.

Psychologists, generally speaking, view personality as the unique combination of psychological and behavioural characteristics by which each individual can be compared and contrasted with everyone else. This is neatly summarised by Mischel (1986) when he defines personality as 'the distinctive patterns of behaviour (including thoughts and emotions) that characterise each individual's adaptation to the situations of his or her life' (p. 4).

Attributes of personality

Personality as a construct, therefore, has a number of attributes (Peterson, 1992). In essence, these are:

1. Personality is an integrated part of an individual – it is something a person is, does or has. People bring their personalities to situations and take them away with them when they leave.
2. Personality is psychological – it refers to the individual (actions, thoughts, feelings) and not to material things such as possessions or status.
3. Personality is made up of smaller units called characteristics (the combination of these individual characteristics creates a unique psychological signature).
4. Personality can be functional or dysfunctional – that is, our characteristics can help us succeed and prosper in some situations but they can also disadvantage us or make us vulnerable in others.

Broadly speaking, much of the work by therapists and academics within the field of personality seeks to understand what factors make us consistent in ourselves but at the same time different or individual from other people (see Focus point 29.1).

FOCUS POINT 29.1

Defining personality

Child (1968: 83) described personality as the 'more or less stable, internal factors that make one person's behaviour consistent from one time to another, and different from the behaviour other people would manifest in similar situations'.

FOCUS POINT 29.2

What makes us similar to/different from others?

As Kluckhorn and Murray (1953) stated, 'every person is in certain respects like all other people, like some other people and like no other person'. Some of these factors are illustrated in Figure 29.1.

ACTIVITY BOX 29.1

How shy are you?

Consider how shy you are and think about the following questions. How often do you get shy? Do you tend to find yourself getting shy in lots of different situations or is your shyness aroused by more specific stimulus? Do you tend to feel shy in front of people you know or strangers? Have you felt more or less shy at different stages in your life?

The answers you give to these questions reveal much about you, in terms of whether your behaviour is motivated by your personality or people or events around you. They also reveal how stable your personality is in terms of consistency (for example, being shy in most situations with lots of different types of people) and over time (for example, feeling less shy as you get older).

We will now explore such questions in relation to personality as a whole.

To appreciate what makes us individual we also need therefore to consider what factors make us similar to or the same as others (see Focus point 29.2).

Armed with these considerations, modern personality research offers valid and useful insights into human psychology. It is concerned with such questions as the role played by personality in physical health and sickness, job success, attraction and criminal behaviour. Are certain individuals more prone to stress? Are specific personalities more likely to succeed in specific occupations? Are certain personalities more attractive than others are? Is there such a thing as a criminal personality? We will consider some of this applied research throughout this section (see Activity box 29.1).

Self-test: According to Peterson (1992), what are the main attributes of personality?

Perspectives of personality research

There are many theories of personality and these can be neatly categorised into sub-groups using two concepts. The two concepts that allow us to categorise theories of personality are perspectives and paradigms.

A perspective is an approach or outlook and it should be recognised that there are two perspectives that guide work relating to personality research. These two perspectives are clinical psychology and academic psychology. Both have made significant contributions to our understanding of the nature of personality and both perspectives have well-known psychologists allied to them. While these two

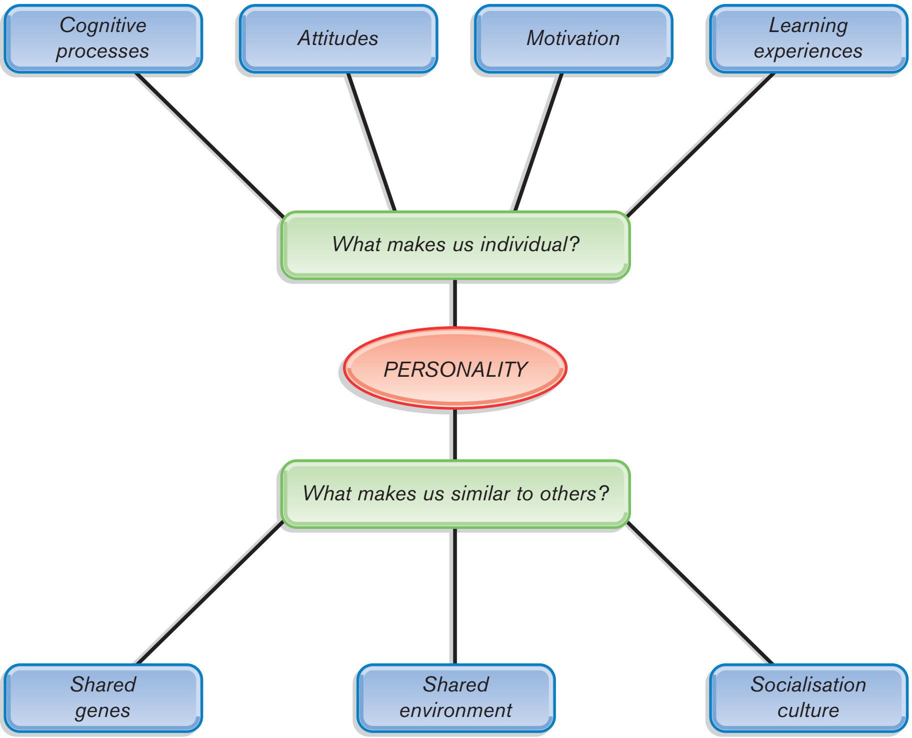


Figure 29.1 What makes us similar to/different from others?

PEOPLE THINK I HAVE BIG EARS, BIG EYES, AND BIG TEETH!

different perspectives seek greater understanding of the formation, regulation and influence of personality, they differ in a number of significant ways.

Clinical psychology

Clinical psychologists working within personality research tend to focus on how people generally adapt to everyday life and how the individual copes with the stresses and challenges of daily life. Clinicians are primarily concerned with those individuals who fail to adapt. Clinical psychologists therefore often seek to intervene by studying each person in depth in order to improve the lives of these individuals through therapy.

The study of one individual without comparing them to any other is called the idiographic approach to studying personality. Gordon Allport, a well-known personality theorist, argued that personality should be studied idiographically, otherwise unique aspects of individuals could be overlooked.

Many well-known personality theories have evolved out of clinical practise and the idiographic approach. Indeed many of the best-known personality theorists were clinicians: Freud, Jung and Rogers, for example.

The advantages of this approach are that:

- It recognises everyone has a unique combination of personality characteristics and as such each person should be studied in their own right.
- Any attempts to improve people's lives must be based on individual study and intervention. To suggest an intervention based on group prediction might be inaccurate.
- The study of individuals allows us to investigate unconscious processes more accurately.
- By studying an individual we can see how they progress over time (if intervention works).

It is not without its suggested drawbacks, however:

- The clinical method poses methodological problems. It has been criticised for being too subjective. There is over-reliance on the clinician's observational abilities and record-keeping skills.
- Gaining insight from clinical populations only reveals information about clinically diagnosed individuals. It would be wrong to generalise any observed findings to non-clinical populations. (See Class activity box 29.1.)

Academic psychology

In contrast to the clinical perspective in studying personality, academic personality researchers study groups of people. They examine selected aspects of personality rather than attempting to deal with the whole person. So for example they might see how shyness manifests itself across a variety of people (gender, age, culture, occupation) in a variety of situations. This approach to studying personality is often called the nomothetic approach.

CLASS ACTIVITY BOX 29.1

Personality and observation

Find three pictures of famous people, for example: Tony Blair, Madonna and David Beckham. Write down one word that you think best describes each of them. Ask someone else who is at hand to do the same. Compare the descriptions that different people have given these three individuals.

Why do you think you have used the same or different words to describe them?

Do you really think these words best describe their personalities or are they merely describing what you know of them?

This is one problem with personality research: simply relying on observation of people does not allow us to gain a full three-dimensional picture of that person. For example, we generally see famous people in one setting: in the media. But would they be different in other settings? How would these individuals describe themselves?

Thus to understand the nature of personality we need to employ multiple methods of investigation, namely observation and self-report. In other words, we need to supplement what we observe about other people's personality characteristics with the observations that these individuals make about themselves.

Researchers from this perspective try to describe personality in terms of sets of dimensions (personality traits) that can be applied to describe any person. They thus tend to express their observations in quantitative terms such as statistical means and other statistical concepts. By assigning quantitative scores to each individual, researchers can then see how people compare with one another. So for example, imagine you had just completed a questionnaire to find out how aggressive you were. The researchers give you a final score. This score is practically meaningless to you unless you can compare it with other people's scores to see where you fit in relation to them (e.g. less aggressive, as aggressive, more aggressive).

Well-known academic personality theorists are Eysenck, Cattell, Allport and Costa and McCrae.

The main advantages of the academic approach are:

- It seeks to obtain precise, valid and reliable measures of personality in an attempt to establish what is common or usual across people.
- Personality dimensions can be used to describe all people. Thus neuroticism is assumed to be a personality dimension on which all people can be located (some people are highly neurotic, most people are average, some are hardly neurotic).

It does, like the clinical perspective, have some suggested weaknesses:

- Its focus on groups of people rather than individuals tends to disadvantage itself in terms of being able to identify deep-rooted unconscious processes.
- Describing people's personalities in terms of numbers rather than the richer and more in-depth method of words brings accusations of shallowness and reductionism.

Paradigms guiding personality theories

We are now aware of the perspectives that guide research into this area of psychology. However, before we can start to evaluate the contributions of the various theories concerning personality we need to place them within the broad context of the differing paradigms they are influenced by. In other words, while there are many individual personality theories many of them are related by the strategies or methods they employ and so can be placed into sub-groups, called paradigms or *domains*.

As you will remember from earlier chapters, a paradigm is 'the language, theories, methods and limits of the science. It determines which aspects of the world the scientist studies and the kinds of explanations he considers' (McCain and Segal, 1973, p. 81). Domains are a 'speciality area of science and scholarship, in which psychologists have focused on learning about some specific and limited aspects of human nature' (Larsen and Buss, 2002, p. 15).

There are five main paradigms/domains guiding research into personality psychology and these are briefly outlined in Table 29.1.

Each of the five paradigms focuses on different aspects of personality. If we are to have a better understanding of the whole concept of personality, we should see these domains as jigsaw pieces that collectively create a complete picture. We can evaluate each dimension's contribution to our understanding of personality within the context of a specific question about the nature of personality.

Self-test:

- What has been the contribution of clinical psychology in our understanding of personality?
- What are the main defining features of academic psychology's approach to investigating personality?

Personality: a conscious or unconscious process?

Are you always aware of why you have done something or what you will do or say next? There are times when even we are surprised by what we do and what we say. One of the questions that is of interest to psychologists is whether personality is a conscious process (we have to actively think about being who we are) or whether the manifestation of our personality is unconscious (rather like an autopilot on a plane). The interpersonal (psychodynamic) approach contends that some elements of personality manifestation (particularly problem behaviour) reside in the person's unconscious (the part of the mind outside of the individual's immediate awareness). Focusing on the unconscious will give us a better understanding of how personality is individually manifested (Ellenberger, 1970). So memories of past traumatic events can be forgotten yet still cause psychological problems and influence our personality (Bass and Davis, 1988). Interpersonal theories of personality have mainly developed out of clinical practice.

So what evidence is there to suggest that unconscious mental processes are responsible for how our personalities develop?

Sigmund Freud and psychoanalysis

Freud (1856–1939) is credited as the father of psychoanalysis. He suggested that unconscious mental processes and experiences can shape the development and manifestation of personality. Such processes, he maintained, start in infancy (with what he termed primary processes, characterised by impulses) and develop into adulthood (secondary processes, the realisation that our impulses have to fit into the demands of the world around us).

For Freud, the unconscious part of human thinking was one of the fundamental driving forces of personality. He conceptualised the mind as being composed in a way similar to an iceberg (see Figure 29.2).

The smallest part of the mind, the tip of the iceberg, composed of conscious thought processes – those mental abilities that we are fully aware of.

TABLE 29.1 **THE MAIN PARADIGMS GUIDING THEORIES INVESTIGATING PERSONALITY PSYCHOLOGY AND THEIR BASIC DEFINING PRINCIPLES**

Characteristics	Main theories	Paradigm
Psychodynamic	Sigmund Freud Carl Jung Alfred Adler Anna Freud Erik Erikson	Assumes individuals' personalities are motivated by unconscious emotional conflicts (mainly originating in childhood) Seeks understanding via case studies (in terms of dreams, free association and creativeness) Aims to change individuals by freeing the energy devoted to neurotic symptoms and therefore allowing the development of a more positive personality **Example:** a childhood experience that may be buried in the unconscious and that affects negatively how an individual might relate to others
Humanistic	Abraham Maslow Carl Rogers George Kelly	Interested in personality in terms of how people's conscious experiences and drives help or hinder their ability to reach their full potential Criticises scientific psychological methods in trying to measure personality in that such an approach is too mechanical and misses the essence of individuals; case studies have been used by some humanistic personality theorists as the favoured method of study However, it remains mostly empirically unsubstantiated and is criticised for this reason **Example:** success in family life may give an individual happiness, contentment, reward and satisfaction, which they may take to other parts of their life (such as work), or vice versa
Trait	Gordon Allport Raymond Cattell Hans Eysenck Costa and McCrae	Assumes that individuals have stable personality characteristics evident in behaviour across a multitude of situations Tries to describe and predict how individuals might behave based on their personality traits Measures personality via questionnaires **Example:** using Eysenck's Personality Inventory (EPI), which measures introversion–extroversion to predict music-listening choices

TABLE 29.1 CONTINUED

Characteristics	**Main theories**	**Paradigm**
Cognitive-behavioural	Albert Bandura Julian Rotter George Kelly Walter Mischel	Assumes people's thoughts and beliefs are central to personality Seeks to measure these thoughts/beliefs and to see how they lead to behaviour in specific situations (personality), and how the expression of personality through behaviour shapes future cognitive processes Seeks to measure and understand personality using self-report measures (questionnaires or interviews) and in some cases via observation Aims to facilitate harmony between individuals and the world around them (by changing either the individual or the environment) **Example:** if a child learns that tantrums achieve a desired result then the rewards for such behaviour condition and establish a set of behaviours that will probably be used in later life
Biological	William Sheldon Robert Plomin Hans Eysenck C. Robert Cloniger	Assumes people's personality characteristics are either inherited and/or are biologically influenced by hormones Seeks to understand personality via work with twins and through neurological research Aims to improve personality through medication or gene manipulation/selection **Example:** finding a relationship between the existence of a specific gene and a personality trait, such as anxiety
Behavioural	Burrhus Skinner John Dollard and Neal Millar	Forces of conditioning and reinforcement have shaped personality Seeks to understand personality via observation Emphasises the role of learning in the development of personality and aims to enhance positive personality characteristics through reward and punishment **Example:** if a child learns that aggression in the playground will bring immediate gratification of a need or goal then it is likely that aggression will be reinforced and used more often; if such aggression is punished, however, its use as a strategy should diminish

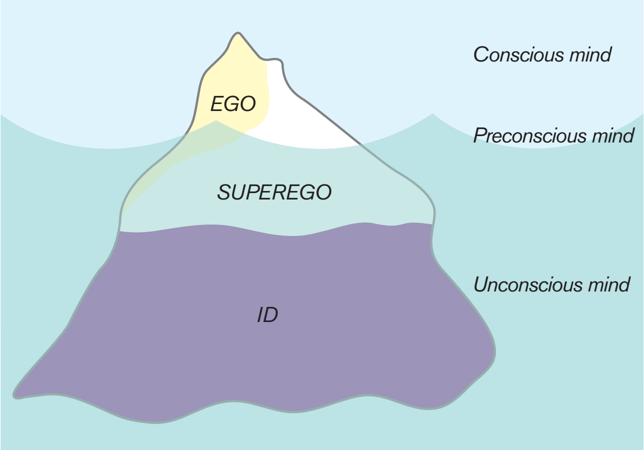


Figure 29.2 Freud's view of the mind as an iceberg

Freud referred to preconscious mental processes as those thoughts or memories that we may not be consciously thinking of but that we can easily and readily bring into our conscious awareness. So while you are not thinking of your telephone number, if I asked you what it is you should be able to bring it into conscious thought.

According to Freud, however, by far the largest part of the mind is comprised of unconscious processes. For Freud, evidence of the unconscious was provided by 'slips of the tongue' and through the interpretation of dreams. The unconscious contain instincts and drives, childhood memories, traumatic events, which may, according to Freud, been deliberately forgotten (or cast out of conscious awareness) or even repressed.

Stages of personality development

Freud proposed that personality developed in early childhood through a series of what he called 'psychosexual stages' (see Table 29.2). A fixation at one stage or another has implications at an unconscious level in adult life.

Development of Freud's work

Freud's suggestion that unconscious mental processes are influential in how our personalities develop and are manifested gave rise to an immediate debate. Many criticised his work (as we shall see later) and many of his initial followers disagreed with elements of his theories. Psychodynamic theory then splintered into two groupings: the neo-Freudians and the ego-psychologists.

The neo-Freudians maintained many of Freud's initial ideas but many went on to develop their own approaches to the study of personality and expanded them in new directions. Carl Jung (1875–1961), via his theory of 'analytic psychology', agreed with Freud's proposal that the unconscious played a significant part on personality, but disagreed with his theory in its entirety. Jung (1964) argued that complexes resided in our unconscious. These complexes could either be positive (perfection) or negative (power). Alfred Adler (1870–1937), by way of contrast, in his 'individual psychology theory', emphasised the importance of social factors rather than sexual urges in the development of personality. He did not agree with Freud in the extent to which unconscious processes were influential in personality. Unlike Freud, Adler saw conscious processes as the major contributing factor to personality but he did recognise that one unconscious process might play a part (Adler, 1930).

Ego-psychologists such as Anna Freud (Sigmund Freud's daughter) and Erikson emphasised the role of ego development in personality. Anna (Freud, 1936) identified three sources that the ego responds defensively to: displeasure, danger in the outside world and unconscious impulses from the Id. One of the ways in which her work differed from that of her father was that, rather than trying to derive childhood experiences from adult patients, Anna worked directly with child patients. One of her main contributions was that she helped adapt psychoanalytic techniques for use with children. Other theorists developed Sigmund Freud's work. Erikson's lifespan theory (1902–1994) moved psychoanalytic thought out of childhood and he maintained that adulthood was a continuing process of development that was influenced by past experience. Like Freud he did propose a number of stages in terms of personality development (Erikson, 1978) but he rejected Freud's notion that identity was fixed in childhood. He argued that identity was in actual fact a lifelong process. He did not agree entirely that unconscious processes accounted for personality manifestation entirely. He also recognised the importance of the societies we live in and their effect on our thoughts, beliefs and behaviour.

Freud's work still arouses strong opinions. Some personality theorists argue that his work (or major parts of it) is still very relevant (Westen, 1998), while others argue that psychoanalysis should be abandoned (Eysenck, 1985). So what are the positives and negatives that can be taken from Freud's work?

Evaluation of Freud's theory

There is no question that Freud was influential in the development of psychology and research on personality. His theory of the stages of personality provided the springboard for the field of developmental psychology. His work also provides the first comprehensive personality theory and stimulated the development of personality assessment techniques. He also drew attention to the possible influence of unconscious mental processes on the development and manifestation of personality. Does research support Freud's ideas? There has been some empirical support for facets of Freud's work and recent research by Myers (2000) has provided support for concepts such as a repressive coping style.

Major critics of Freud's theory maintain that his work is out of date and would not apply to the very different society we live in today. He overemphasised the importance of unconscious principles in respect of personality.

TABLE 29.2 FREUD'S PSYCHOSEXUAL STAGES AND IMPLICATIONS OF STAGE FIXATION FOR BEHAVIOUR IN ADULT LIFE

Adult signs of fixation	Defining features	Psychosexual stage
Oral	First year after birth. The mouth is the centre of pleasure at this stage. Babies use their mouths to eat and explore everything around them.	Problems arise when oral needs are either under- or over-stimulated. So early or late weaning may lead to adult behaviours such as overeating, smoking and drinking to excess. Over-dependence on others is also, according to Freud, a by-product of fixation at this stage.
Anal	During the child's second year. Here, according to Freud, there is a clash between free bowel movements at will and parental demands for appropriate toilet training. Thus it is at this stage that the ego starts to develop.	Fixation at this stage can occur when toilet training is too harsh or starts too early or too late. Associated adult behaviours might be excessively concerned with control and cleanliness, or they might be reckless or impulsive.
Phallic	Between the ages of three and six. Focus of attention diverts to the genital area. Here, according to Freud, boys develop sexual feelings for their mothers and form a desire to eliminate the competing affections of the father (known as the Oedipus complex). Girls, on the other hand, develop penis envy and try to compensate for their lack of a penis by identifying with the father (the Electra complex). Here the superego starts to develop.	Freud believed that fixation at this stage could lead to problems later in life via unresolved conflicts with one's same-sex parent. These could be manifested by aggression, difficulty with authority, inability to hold down a stable relationship and, in extreme cases, socially disapproved-of sexual behaviour.
Latency period	Following on from phallic stage through to the onset of puberty. Here the ego represses sexual instinct internally, and this is reinforced externally by parents' and teachers' suppression of sexual matters. Child learns values of family and culture.	
Genital	At puberty and during adolescence and spanning the rest of the individual's life. Via hormonal changes, sexual impulses reappear. The genitals again become the focus of pleasure.	Individuals reach the genital stage only when they have successfully resolved the conflicts at the prior stages.

However, it should be remembered that Freud lived in the Victorian era with very conservative attitudes towards sex and towards women. His work is based on a small, select group of paying clients (mainly wealthy and educated women) and his observations restricted to therapy sessions only. His work on the stages of personality development have been criticised by many psychologists who do not agree that personality stops developing at around 5 or 6 years of age. Personality can dramatically change throughout the lifespan. One of the most potent criticisms is that Freud's work and that of psychodynamic theory in general is not open to scientific investigation. It is hard to disconfirm Freud's theories since they deal with theoretical concepts which are difficult to scientifically measure and test (Holzman, 1994).

Object relations theory: rethinking unconscious influence

Freud's emphasis on sexuality and unconscious processes has more recently been rethought. Contemporary psychodynamic theories instead focus on social relationships and their origin within childhood development. Object relations theory is one example and it deal with how individuals internally conceptualise (in terms of feelings and attitude) people and objects around them. While there are several versions of this approach, which emphasise different aspects, all object relations theories share some common assumptions. One assumption is that the child's developing relationship with others around (external forces) them are more important that internal urges and desires (internal forces). Children create their own unconscious mental representation of others around them. So important others (e.g. the mother) become internalised by the child. Each child has an internal representation of their mother to whom they can relate. Thus children can have a relationship with this internalised object (mother) even when she is not present (so children can still imagine what their mothers might say if they do something they are not supposed to even when the mother is not physically present). So in essence object relations theorists attempt to understand personality in terms of how children develop relationships with others around them based on how they mentally represent this relationship. So if children have formed the impression that they do not like someone, then this will influence how they behave with that person in the future. Melanie Klein (1964), John Bowlby (1988) and Heinz Kohut (1977) developed their accounts of personality based on the principles of object relations theory. Objects relations theory has been applied to investigating why children of divorced parents might themselves have difficulty with relationships. Judith Wallerstein et al. (2000) suggests the ghost images of their parents failed marriages and the strong emotions of their own fear of subsequent relationship failure produce ambivalent internal images of relationships in general.

Evaluation of the role of unconscious processes on personality

One way of verifying if unconscious processes account for the way our personality develops is to evaluate psychotherapy as a therapy technique. For example, psychoanalysis focuses on unconscious processes. If this method of psychotherapy is seen to be effective then we might conclude that personality is largely influenced by unconscious processes. So what is the evidence? It would seem that psychotherapy is neither more nor less effective than other forms of therapy that do not aim to uncover unconscious mental processes. Some research has supported the influence of unconscious processes. Fiona Gardner (1991), for example, has used object relations theory in her attempts to explore factors linked to self-harming behaviour in young women. Jodeyr (2003) has employed psychoanalysis in her research on the emotional and personality development of second-generation refugees and by working on these unconscious thoughts and attitudes has witnessed positive improvements in these groups. Other research has contradicted the work of psychotherapy. For example, Pennington (2003, p. 50) states: 'How can you have an unconscious if you are not aware of it?' Wallerstein (1989) reported a 30-year longitudinal study that compared psychoanalysis with alternative forms of therapy that did not focus on the unconscious. No significant differences were found between these. Daly and Wilson (1990), using incidents of family murders, found that the oedipal hypothesis (sons envying their fathers as they want to have the sole attention of their mothers and daughters envying their mothers in terms of attention from their fathers) is not supported. Rather than finding greater same-sex (son–father, daughter–mother) murder links, it was found that males were the most frequent murderers of fellow family members and they were also the most frequent victims! Such findings suggest that simply concentrating on unconscious behaviour will not sufficiently account for explaining personality development.

Self-test:

- What are the stages of personality development according to Freud?
- Evaluate Freud's theory of personality development.
- What has object relations theory contributed to our understanding of personality?

What is the function of personality?

This question allows us to explore two other paradigms of personality research: the humanistic approach and the cognitive-behavioural approach. The humanistic or phenomenological theorists see personality as a tool for personal growth and development and suggest that our characteristics can serve us in terms of seeking improvements in our quality of life (by, for example, gaining success, friends and satisfaction). The cognitive-behavioural paradigm sees personality as an interface between what we would like and what the world will allow. In other words, personality allows us to interact with the world, form social relationships, learn what is right, what is wrong, and what is good and what is bad for us.

The humanistic or phenomenological paradigm

Humanistic psychologists emphasise personality in terms of growth potential and, like the psychodynamic psychologists, delve into self-understanding. However, this attitude differs sharply with the negativity of the psychodynamic movement. It instead attempts to view on the positive aspects of human personality. Humanistic theorists look at the way 'healthy' people strive for their own positive development through their personalities. MacDonald and Friedman (2002) provide an overview of the research findings exploring the relation of

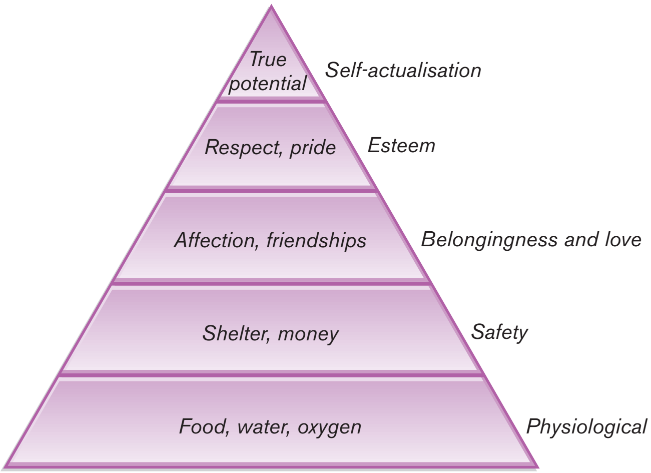


Figure 29.3 Maslow's hierarchy of needs

humanistic/transpersonal phenomena/concepts to human functioning.

Abraham Maslow (1908–1970): hierarchy of needs

Maslow conceptualised individuals as being driven by needs, and that all needs were hierarchically organised. He divided human needs into five levels, with the most pressing needs starting at the base of the hierarchy (see Figure 29.3). Maslow proposed that we must satisfy the lower needs before we can progress and concentrate on obtaining those higher up in the hierarchy. So finding food and water in Maslow's theory takes precedent over, for example, obtaining respect from our peers or fitting in with them. He also suggested that the levels develop with age – so that the first levels occur in childhood (such as need for food, need for safety etc.) and the others develop throughout the lifespan. Maslow (1968) recognised that the higher-level needs were not necessary for survival and so motivation to achieve these needs is weaker than for the more basic needs such as water. The final need stage is that of self-actualisation, where an individual seems to know who they are and have little confusion regarding the route their life should take. Our personality is a tool that we use to gain these needs and attempt to reach this self-actualisation.

Research evidence and humanistic approaches to personality

Hagerty (1999) has provided some evidence from a cross-cultural perspective that people from different countries do try to achieve needs within the sequence Maslow suggested. Baumeister and Leary (1995) have demonstrated that we do possess a need to belong to social groups (such as clubs, gyms and teams, for example). Betz (1984) has mixed support for Maslow's theory. She found that there was a positive relationship between need fulfilment and satisfaction with one's life. She also reported that there was no relationship between need importance and need deficiency.

Applications of humanistic theory

Sonnekus (1998) has tried to develop a system to aid first-year students in their academic environment using self-actualisation principles. Pennebaker (1990) has suggested that the need to belong is an important concept in people facing life-threatening illness. Such support groups include people suffering from all types of serious illness. Indeed, Pennebaker suggests that membership of these groups may even be life prolonging. Thus humanistic principles have been used successfully in areas such as health psychology. Maslow's need theory has also been applied to employment. So, for example, if pay and security are fulfilled, workers might then concentrate on improving their relationships with their co-workers and then finally on developing their own skills, thus moving up Maslow's need hierarchy (Muchinsky, 1997).

The cognitive-behavioural paradigm

Cognitive-behavioural theorists see personality as a package of behaviours that people have acquired through learning and interaction with their environments and which they employ to help them navigate their environments. While recognising that behaviour is learned through classical and operant conditioning, the cognitive-behavioural approach expands this by assuming that much of personality is learned through social interaction. So we gain both our behaviour and cognitive processes via experience in our social worlds. We then use this experience to survive within our environments. So the function of personality is to test our theories of the world around us in order that we might learn how to survive and behave. The cognitive-behavioural approach to personality seeks to understand how learned cognitive thought patterns influence behaviour and how the consequences of a behaviour informs cognition for future actions.

Do cognitive representations of the world influence our personalities?

Kelly (1905–1967) maintained that to understand personality we need to consider how people conceptualise the world around them and how this is represented cognitively in their minds. He viewed people as informal scientists, always generating and testing hypothesis about the world around them. People are motivated to understand the world around them and predict what might happen. Kelly (1955) termed this process *personal construct theory*. In order for us to interpret ad predict we develop cognitive structures, which he termed personal constructs. Through experience and learning in the world, everybody develops his or her own unique set of constructs (cognitive representations of people, events, environments). Kelly suggested that these personal constructs were represented via a bipolar scale (either/or representation). So for example personal constructs you might apply to your boss could be:

Helpful – Unhelpful Intelligent –
UnintelligentEffective – Ineffective

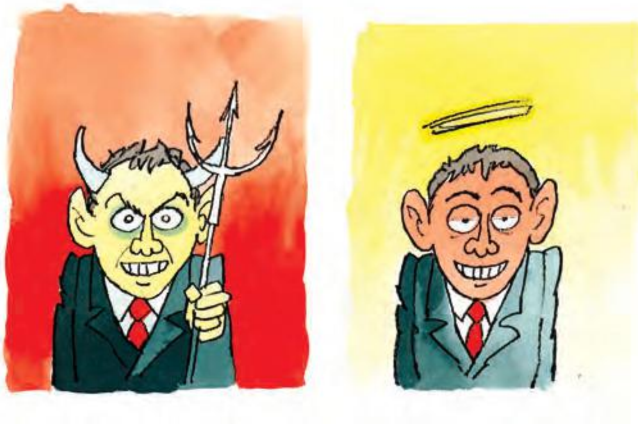
Kelly argued that we engage in a process of template matching with these constructs. So if your boss engages in ways consistent with your construct then it is retained. If the behaviour is not consistent then it is modified. We learn which descriptions to apply to which people and based on these descriptions, we react to them accordingly. So, for example, different people might use different personal constructs to describe the same person. Some might describe Tony Blair as a decent, hard-working honest man, while others might say he is arrogant, dishonest and power mad.

The way in which we test these constructs is through our personalities and engagement with our environments. So if you are hard working and hit a problem at work but your boss refused to help you, you would form the construct that your boss is unhelpful. Future behaviour will either reinforce or weaken this construct.

Kelly proposed that some personal constructs were more important than others for predicting and interpreting our world. He called these *superordinate constructs*. The less important ones he called *subordinate constructs*. Subordinate personal constructs for one person might be superordinate for another person. So Jane might be conscientious in everything she does, but Karen can be conscientious in only some of the things she does. Kelly also recognised that everyone had a different perception of world reality and that this would influence the behaviour that people engaged in. He called this *constructive alternativism*.

Personality: a tool of social environmental interpretation?

Bandura envisaged personality from a social-cognitive perspective. He proposed two theories that suggested personality affects how we react to environmental stimuli. These were cognitive social learning theory (1977) and reciprocal determinism (1986). He viewed behaviour, internal personal factors and the influences of the environment as inseparable parts of each other. So people's eating habits (past behaviour) influence their eating preferences (personal factor) which, in turn, influence how different foods (environment) affect their behaviour. So Bandura recognised that different people choose different environments (some people like to go to a large cinema complex to watch a film, others prefer a smaller local cinema, yet others prefer to watch it in the comfort of their own home). He proposed that personality influences how we interpret and react to events/stimuli (so a snake is a cute pet to some people and a loathsome reptile to others). Bandura also argued that our personalities often contribute to situations that we react to (so if we expect someone to be rude to us, we may be offhand to them in the first place which then causes the behaviour we expected in the first place). So in essence personality is a sum of our internal personal factors, our cognitions and the behaviours we use to deal with our environments.



What's your view of Tony Blair?

One important concept that Bandura suggested was self-efficacy. *Self-efficacy* is a person's self-rated judgement of success for any behaviour they may engage in. For example, before we try to lift anything heavy we ask ourselves what are our chances of succeeding. If we feel they are good we will try, but if we judge the odds of lifting to be low, we probably will not try and will instead seek help. Self-efficacy is therefore learned.

Other psychologists have emphasised that personality enables us to learn about the success or failure of our actions and the consequences of behaving in certain ways in certain environments. Mischel (1984) believed that learned expectations are different for each individual and therefore make that individual unique. These expectation dimensions Mischel labelled 'person variables'. In Mischel's view the most important person variables were: *expectations* (what the individual expects to happen after a behaviour and what he/she thinks they are capable of doing – self efficacy; *perceptions* (how the environment is perceived by each individual); *competencies* (what thoughts and actions the person can perform); *values* (the individual's subjective world ideals); and *plans* (a person's plan for reaching their goals). Mischel argued that it is not enough to measure someone's traits to predict how they might act, we also need to take into account the situation in which it occurs. So a helpful person might help someone who trips over in the street but might not help someone who gets mugged at knifepoint. The perception of the situation (in this example, risk of injury for offering help), Mischel argues, can override a trait.

FOCUS POINT 29.3

Personality and the environment

Personality is also subject to environmental pressures. So while personality is usually expressed at an individual level, the social relationships we have will also guide and influence our behaviour. There are examples to show that our personalities can be influenced by the social groups we belong to (for example, culture). The expression of our personalities via behaviour can also be altered by these groups.

Culture

Personality psychologists believe that exploring personality expression across cultures is important (Church, 2000). This allows us to investigate whether certain personality concepts are prevalent in certain cultures. So, for example, western society is based on individualistic principles – that is to say independence and uniqueness are held as positive characteristics. (Most western films, for example, depict lone heroes overcoming evil groups. Eastern society, however, reflects a more collectivist ideology, where each individual is a contributing member to a successful group.)

Do these differing cultural perspectives have an impact on how our personality develops? It seems so. Kitayama et al. (1997) reported that Japanese students had a greater sense of positive feeling if they felt they had contributed to establishing interpersonal relationships with others. In contrast, American students associated feelings of positivity with their individual personal accomplishments. It is not just between different countries that overarching personality differences have been reported. Nisbett (1993) reported that people from the northern United States were less likely to engage in violence (physical) to avenge a personal slur than were those from the southern United States. Homicide rates for crimes related to defending one's own reputation were far higher in the southern United States than in the northern part of the country.

Conformity and obedience

There are times when it would be foolish or dangerous to follow our own personality. We might risk sanction or punishment from society for doing so (for example, breaking the formal laws in our society), or hostility and ostracism from the smaller groups we belong to (parents, friends). So despite being an individual there are times when we abide by the rules and regulations provided to us, so that we resemble everyone else around us.

Our environment can, therefore, be quite potent in reining in our personalities. However, our personality characteristics can regulate our obedience to rules. It has been seen that people who score highly on authoritarianism tend to conform more often, as do people who score highly on external locus of control (Blass, 1991). In addition, Forbes (2001) investigated, among other factors, personality differences in individuals with and without tattoos or body piercings. Results showed that tattoos and piercings in college students are associated with significantly more risk-taking behaviour, greater use of alcohol and marijuana, and less social conformity.

Evaluation of the social learning approach to personality

The greatest strength of these cognitive and behavioural theories is the generation of empirical research based on objective observations to test their assumptions. This approach to understanding personality has also yielded a number of effective therapeutic approaches to the treatment for a variety of psychological disorders, such as depression (Furlong and Oei, 2002) and obsessive compulsive disorders (Salkovskis, 1999). So it would seem that personality does act to some extent as an interface between our cognitive representation of the world and how we should behave in that world to succeed and survive. Personality is a tool by which we learn the trial and error of our behaviour in relation to our environment (see Focus point 29.3). A child who throws tantrums to get what it wants (aggression as a tool of personality) might develop two different personalities depending on how the environment treats such outbursts. If the child gets scolded every time it throws a tantrum then this personality aspect should diminish. If the child gets rewarded with what it wants to stop the tantrum then such reinforcement will only develop these tantrums as a useful personality tool.

Self-test:

- What have humanistic psychologists emphasised in terms of personality growth?
- Describe Maslow's hierarchy of needs.
- How do cognitive-behavioural theorists see personality?
- What has been the social learning theory's approach to defining personality?

What is personality?

Just what does personality consist of? This is another important question in the field of personality research – what constitutes personality? We have descriptive terms for personality such as dispositions or characteristics. The most widely accepted term in personality is 'trait' (see Definition box 29.1).

DEFINITION BOX 29.1

Traits

Personality traits are the tendencies that we use to describe how someone thinks and behaves most of the time.

Exactly how many or how few traits make up our personality? Do we all have the same traits at the basis of our personalities or do we have different combinations of traits? Such questions have given rise to a fourth paradigm of personality research – the *trait approach* to understanding personality.

However, people do not always behave in accordance with traits they possess. For example, if Matthew had a leadership trait, this does not mean that Matthew will take charge in all social situations. In some situations leaders might already have been chosen and so Matthew will override his leadership trait's need for expression. Also in situations where Matthew felt less confident (in new scenarios) he might look to be led by others who have had more experience in such a situation.

While there are many trait theorists, they all share three common assumptions and are guided by three fundamental questions.

The three assumptions are that:

1. Individuals each possess particular personality traits to either a greater or lesser extent. Perhaps the best analogy here is to think of individual traits as having volumes. In some people the volumes on certain traits are high, in others they are medium and in others they are low. So while we all possess the same personality traits, different combinations of sound volume across these traits create unique personalities.
2. Traits remain relatively stable across time. So a sociable person will probably remain generally sociable throughout his or her lifetime.
3. Traits remain stable across a wide diversity of environmental and social situations. So someone who is competitive will probably be competitive at work as well as on the tennis court.

Trait theories are also concerned with three questions:

1. How should traits be conceptualised? In other words how are traits defined?
2. How can those traits that are most important to personality be identified among the huge numbers of ways people differ?
3. How can all personality traits be identified?

Just how many traits are important in personality?

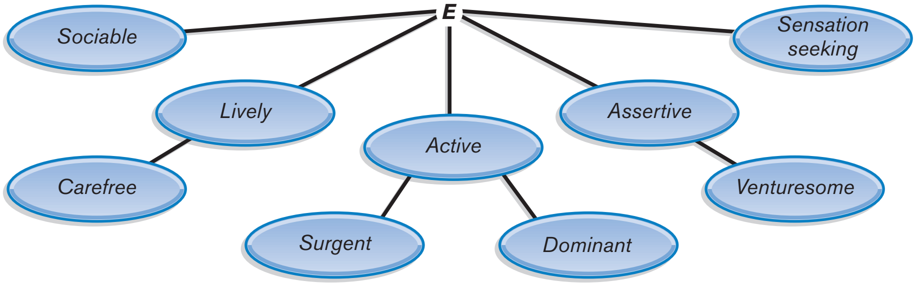
Three traits?

Jung (1875–1961), although a psychoanalyst, started work that influenced the trait movement. He proposed that individuals develop and vary along three important dimensions (traits), introversion-extroversion, thinking feeling and sensation intuition. So people can differ in their levels of sociability, indicated by having different levels of introversion (a tendency to reflect within oneself – characterised by shyness, submission and quietness) and extroversion (a tendency to focus on the world around us – characterised by enthusiasm, sociability, dominance over others). For Jung, extroversion was a focus on things, people and events outside of oneself and introversion related to looking inside oneself and concentrating on our feelings and thought. Jung maintained that an individual could have tendencies towards both introversion and extroversion, but that one would be dominant.

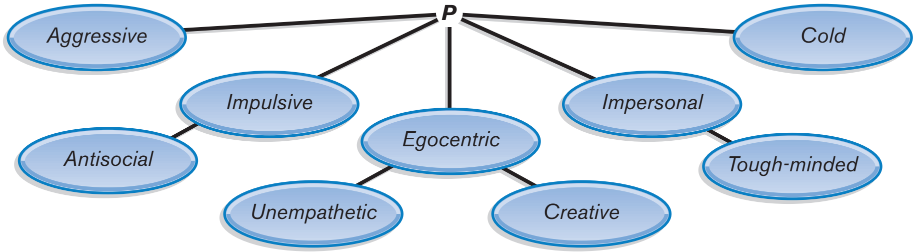
Like Jung, Eysenck (1991) proposed a model of personality based on three broad traits that he believed were inherited and had psychophysiological foundation. These three broad traits are: extroversion, psychoticism and neuroticism. *Extroverts* have a high energy level and are sociable and like activity and people around them. *Introverts*, contrariwise, like to spend more time alone, prefer routine and are more evenly paced. A person scoring highly on the *neuroticism* dimension is anxious and can often be depressed as a result. Low scores reflect people who are emotionally stable, cope better with stressful events and can return to normality faster than a neurotic person. People scoring high on *psychoticism* lack empathy and have little sympathy for the suffering of others, can be aggressive and are often described as antisocial loners. Each of these has a number of underlying associated sub-traits (see Figure 29.5). For Eysenck, the basic personality traits should have high heritability. He also linked his proposed traits to the working of the central nervous system. So for example introverts would be more easily aroused and show greater physiological arousal reactions.

However, Eysenck's work has been criticised on a number of grounds – and in particular in terms of the terminology employed in the theory. For example, the term 'psychoticism' is outdated and negative and might be better superseded with a more acceptable label such as 'antisocial personality'.

(a) Hierarchical structure of the trait Extroversion–Introversion (E)


E
Sociable
Sensation seeking
Lively
Assertive
Active
Carefree
Venturesome
Surgent
Dominant

(b) Hierarchical structure of the trait Psychoticism (P)


P
Aggressive
Cold
Impulsive
Impersonal
Egocentric
Antisocial
Tough-minded
Unempathetic
Creative

(c) Hierarchical structure of the trait Neuroticism (N)

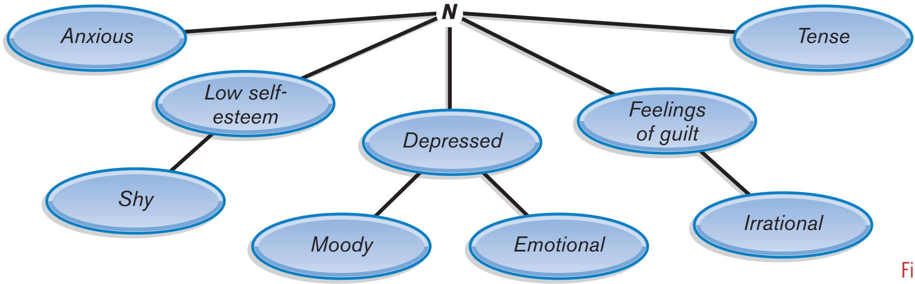

N
Anxious
Tense
Low self-esteem
Feelings of guilt
Depressed
Shy
Irrational
Moody
Emotional

Figure 29.5 Eysenck's hierarchical model of personality

Sixteen traits?

Cattell (1946) employed factor analysis to identify and describe the underlying structure of personality (see Research methods box 29.1). He used a 'psychometric' approach (a way of studying both personality and intelligence in terms of underlying structures) in his bid to describe the structure of personality. We will consider the psychometric method in more detail in a later chapter.

Cattell therefore sees personality as a cocktail of characteristics that can be used to predict behaviour. He also makes a distinction between what he calls *surface traits* and *source traits*. Surface traits represent the near infinite differences that can be observed between people. He suggested there are 171 surface traits, such as conscientiousness, competitiveness, flexibility etc. These surface traits can be grouped together into related groups of traits, which he called source traits. Examples of source traits would be humble versus assertive or emotional versus stable. So if there are 16 of these, and people can either be either high, medium or low on each of these source traits, how many combinations would there be? Around 43 million to be precise – that is 43 million different types of people! Cattell (1984) developed the 16 personality factor test (16PF) based on these source trait groupings. He has applied this test to investigation of structure of the 'abnormal personality'. One major criticism has been that many researchers have failed to replicate the existence of 16 main personality traits and others have suggested that a smaller number of factors is sufficient in encompassing how the majority of people differ. There has also been criticism that the 16PF is not applicable to all cultures, for example black mother-tongue speakers in South Africa (Abrahams, 2002).

Five traits?

It has been seen over the past 50 years that certain traits seem central to many personality theories and so there are those psychologists who suggest that the core of personality is determined by five central traits (Costa and McCrae, 1982). The five that have been most commonly suggested

RESEARCH METHODS BOX 29.1

Factor analysis

Factor analysis is a statistical procedure for analysing a complex phenomenon with the aim of simplifying it into more basic and more manageable patterns of description. For example, take a sample of earth from your back garden. What is it made of? Well, if we separated it all out into its basic elements we would probably find soil, maybe traces of clay, peat, flint, granite, pebbles, leaves, roots, twigs and so on. This is a very long-winded way of describing what earth is made up of.

Why not instead make life simple by saying earth is made up of stones/rock, soil components and decaying vegetation? What we have done here is to form subgroups of related items. This idea can be applied to psychology too.

What if we wanted to describe personality? There are hundreds of potential personality traits but we could make life simpler by seeing if certain traits are related to one another. For instance, nervousness, anxiety and worrying are probably all related, so if you score highly on one of these you are likely to score highly on the others. We might call these three concepts 'neuroticism': we have taken three separate descriptions and placed them into a category where we can now employ one description.

This approach can be useful for describing personality because, rather than describing each person in terms of all their traits (which would take a very long time), we can instead simplify things by describing their dominant traits.

are 'extroversion', 'neuroticism', 'agreeableness' (cooperation, trusting and helpful at one end of the trait, and critical, irritable and suspicious at the other), 'conscientiousness' (self-reliant, careful and knowledgeable at one end and carelessness, and ignorance at the other) and 'openness' (creative, daring and independent at one end with conforming, conventional and unadventurous at the other). Those of you with a good memory will already see that this is very similar to Eysenck's three-factor model.

While there has been considerable support for the existence of four out of the five factors (McCrae and John, 1992) there has been some disagreement over the fifth, which Costa and McCrae labelled as 'openness'. This could be due to the fact that different cultures may attach different meanings to the word 'openness' itself and therefore it is difficult to pin down a definitive label which semantically reflects such a term cross culturally.

Are some traits more important than others?

Allport (1897–1967) suggested that each person has unique, key qualities. He proposed the existence of so-called 'common traits' and 'personal dispositions'. For Allport, 'common traits' are those characteristics shared by a population (because of a biological similarity or common cultural heritage). He viewed personality characteristics in terms of an individual's goals or motives, which are governed by personality dispositions (a trait peculiar to each individual). Those traits that have the greatest influence on our behaviour Allport labelled *cardinal traits*. Not everyone has these, but they are characterised as being the main driving passion in an individual's life (so for example Mother Theresa's desire to help the suffering of others governed her life). A second set of traits, called *central traits,* form the main basis of personality and these are qualities that we all possess and that guide our behaviour. So the five words that you used to describe yourself at the start of this chapter would be your central traits. Lastly, he also suggested that we possess secondary dispositions which do not appear in many situations or influence a variety of behaviours. For example, you may be able to paint walls and ceilings and lay some tiles, but that may just about sum up your relationship with DIY! Allport differed in his views from other theorists such as Cattell, by arguing that factor analysis (a statistical representation) could not do justice to the richness of an individual's personality (Allport, 1961).

Allport differs from most other trait theorists by suggesting that we have these cardinal traits, which are unique to individuals. Most trait theorists as we will see propose that people differ in their personalities due to different combinations of traits. They argue we all possess the same traits in essence but the difference we see is that for some people the influence of a trait is high, while for others it is medium and others still low. They do not, like Allport, agree that some traits exist in some people and not in others. Allport's work on cardinal traits is also problematic in terms of research evidence – deciding on any one individual's cardinal trait is a matter of subjective opinion. For example, one friend might describe my key trait as 'the desire to have fun', while another might label it as 'recklessness'. Who is right?

Evaluation of the trait paradigm

There is evidence that traits provide stability in personality in similar types of situation (Izard et al., 1993). People who are confident meeting new people in a bar will generally be fairly confident in that type of environment. However, are traits stable across a diversity of situations? One of the leading criticisms of the trait perspective is that personality traits may not be stable and enduring (see Activity box 29.3). In other words, the assumption of the trait theorists that personality characteristics influence an individual's behaviour always in the same way, regardless of the situation they are in, might be optimistic. Such an approach takes no account of the power of the environment to change how our behaviour manifests itself. So, on the whole, you might say you were fairly outgoing and socially confident.

You might get a little nervous before you give a public presentation. Trait theorists might argue that your social confidence trait would be stable and so given all situations where you might give a speech in public you should feel and perform in the same way. Yet when you gave the leading speech at your best friend's birthday party you were the most nervous you had ever been speaking in public. The fact that you were speaking in front of friends and relatives who knew you quite well made the whole situation much more nerve racking than when you made a speech in front of strangers. So your perception that the environment was now different caused a change in your behaviour, which, according to the trait theories, should have been stable. Mischel (1984), a critic of the trait paradigm, argues that people do not act with predictable consistency. Another criticism levelled at the trait approach is that it might be a good way of describing the structure of personality but it offers little insight into the question of where our personalities come from. Trait theory says little about where our traits originate in terms of whether they are learned, genetically coded or a combination of both.

Self-test:

- What common assumptions do trait theorists share about the nature of personality?
- How did Eysenck view the structure of personality?
- Evaluate Costa and MacCrae's Big Five-factor theory of personality.
- How stable is personality over time?

Biological factors and personality

One of the most significant questions guiding personality research is the extent to which our personalities are influenced by biological factors such as heredity and hormones. Such a question has been tackled by the last paradigm we will discuss, that of biological explanations of personality.

ACTIVITY BOX 29.2

Ageing and personality: is personality stable over time?

How stable are personality traits across the lifespan? If there were evidence that traits are fairly consistent across an individual's life, then this would support the trait theorists' proposals. How might we go about researching this fact? There are two approaches we might take.

First, we might ask someone to judge how similar their present personality is to their personality in their past. This approach is called a 'retrospective study', so called because it asks people to remember their past behaviour. However, an individual's memory might not be very reliable and so the accuracy of their accounts might be questionable.

Second, some people may not want to view their personality as inconsistent. They might simply assume, then, that their present personality is very much like their personality was when they were younger because they feel more comfortable with that image of stability.

A more reliable method of assessing the stability of personality traits would be to assess someone's personality now and then assess it again after a period of years has passed. This method of research is called a longitudinal study and is a popular method with personality theorists interested in assessing whether personality is indeed stable over a lifetime.

So the burning question, then, is 'Is it?' Recent research evidence seems to suggest that traits are not completely fixed and can be changed over time by events in a person's life.

Ardelt (2000) reviewed the findings from 206 sets of results investigating the stability of Costa and McCrae's Big Five personality traits over time. He found that personality tends to be less stable if (i) the time between the tests is large, (ii) age at first measurement is low or over 50, and (iii) a change in individual aspects of personality, rather than overall personality, is measured.

Srivastava et al. (2003) reported that in a large sample of adults aged 21 to 60 (129,515 people) who completed a Big Five personality questionnaire over several time points, conscientiousness and agreeableness increased throughout early and middle adulthood at varying rates. Neuroticism declined among women but did not change among men. They concluded that the variety in patterns of change suggests that the Big Five traits are complex phenomena subject to a variety of developmental influences and therefore not completely independent of the influence of life-changing events.

Maiden et al. (2003) conducted a longitudinal study of 74 elderly women with a mean age of 80. They were assessed on the personality traits of neuroticism, extroversion and openness, and were seen to be moderately stable on all three traits over time. The authors also found that stability was influenced by negative changes in life circumstances. For example, decreased social support and increased unmet needs were subsequently associated with more neuroticism.

Lee and Hotopf (2005) reported that stability of neuroticism and extroversion increased with age. From this finding they suggested that it is the underlying traits that are less stable in the beginning but that these become more fixed in later life. This research therefore suggests that traits might not be equally stable throughout our lifespan.

TABLE 29.3 GALEN'S BODILY FLUID THEORY

Personality label	Associated bodily fluid	Description
Phlegmatic	Phlegm	Abundance of phlegm made a person calm, thoughtful and passive
Sanguine	Blood	Abundance of blood made a person happy, lively and sociable
Choleric	Yellow bile	Abundance of yellow bile made a person unstable, aggressive and excitable
Melancholic	Black bile	Abundance of black bile made a person pessimistic and unhappy

The notion that facets of personality are the products of bodily or biological processes is not a modern concept. In the second century AD Galen, a Roman physician, proposed that it was the presence or absence of four bodily fluids that determined personality (see Table 29.3). While it remained in favour for many centuries, today it is considered somewhat antiquated. It was, however, one of the first recorded physiological approaches to personality.

Biological approaches are founded on the premise that psychological characteristics (such as aggression, shyness) are based on an underlying physiological system. For example, a biologically oriented personality psychologist might argue that a person is introverted because they have an overly sensitive nervous system (a physiological characteristic) and thus try to avoid stimuli that might lead to over-stimulation.

The role of arousal and personality

Arousability theory

Eysenck first proposed the view that people can be described as being either introverted or extroverted. From a biological perspective introversion and extroversion have been described in terms of arousal levels. That is, an extrovert will seek more stimulation than an introvert because their arousal system requires more stimulation to become aroused. If this is true then we should see that extroverts' arousal levels respond less quickly to arousal than introverts' arousal levels. Studies by Bullock and Gilliland (1993) and Brocke *et al*. (1997) have all supported this observation. It does seem to take extroverts more stimulation over a longer period to reach the same arousal levels as introverts.

Jeffrey Gray's (1985) reinforcement sensitivity theory

Gray has proposed a model of personality, which is based on two hypothesised biological systems within the brain. The first of these is what he calls the behavioural activation system (BAS) which responds to incentives and is responsible for behaviour engagement. Thus when the BAS recognises a stimulus that offers a potential reward it encourages approach behaviour. The other system that Gray postulates is the behavioural inhibition system (BIS) which is responsive to punishment cues.

Photo 29.1 Some people seek out stimulation while others are happy to avoid it.

So you might be hungry after a night on the town and see a kebab shop, which activates your BAS to encourage you to enter the shop to buy some food. However, in the past you were violently ill the last time you mixed alcohol with a late-night kebab, so on nearing the shop the smell of the food activates your BIS (memories of being ill), which terminates your approach towards the shop. Instead you decide to go home and settle for a cup of tea and a biscuit! So personality is determined to some extent by the balance between your BAS and BIS.

Hebb and Zuckerman's work on sensation seeking

Hebb (1955) initially suggested people are motivated to seek out an optimal level of arousal, which they are personally comfortable with. So if they are under-aroused relative to this level, further arousal will be considered rewarding and if they are over-aroused, a decrease in arousal will be rewarding. Adopting sensory deprivation research techniques, Zuckerman (1978) observed that some people were not as distressed as others by depriving the senses of stimulation. Zuckerman proposed the term 'high need for sensation seeking', which he applied to individuals who actively seek out stimulation.

He developed the sensation-seeking scale, which measures the degree to which people seek out stimulation. His theory suggested that high sensation seekers sought stimulation while low sensation seekers tended to avoid it more often. He reports various findings to support this, such as those police officers volunteering for riot duty have higher sensation-seeking scores than those officers who do not volunteer for such duties (Zuckerman, 1991). Zuckerman proposes a physiological basis for sensation-seeking behaviour focusing on the role of neurotransmitters (see the psychobiology section). To remind you: neurotransmitters are chemicals in the nerve cells that are responsible for communication between cells using nerve impulses. Monoamine oxidase (MAO) is an enzyme related to maintaining proper levels of neurotransmitters – too much MAO and nerve transmission would be reduced. So, in other words, MAO acts like the brakes of the nervous system (see Chapter 7). Zuckerman (1991) has reported that people who score highly on sensation seeking seem to have lower MAO levels – so they have less inhibition in their nervous system.

Hormones and personality

Theorists working with hormones argue that sex differences between genders occur because each gender has different levels of underlying hormones. Men, for example, have on average 100 times the amount of testosterone in their blood than females do (Hoyenga and Hoyenga, 1993). Higher testosterone levels have been linked to aggressive behaviour and Dabbs and Hargrove (1997) reported that female prisoners with high levels of this hormone received more disciplinary punishments from the prison authorities than those female inmates with lower testosterone levels. Cashdan (2003) investigated hormone levels and self-reported expressions of competitive feelings in a sample of women. Results indicated that women with low levels of androstenedione and testosterone were less likely to express their competitive feelings overtly, while women with high levels of androstenedione were more likely than other women to express their competitive feelings through verbal aggression.

However, we do need to be cautious when interpreting such research, since the vast majority of the studies of this nature are correlational and so we cannot be sure if the testosterone has caused the behaviour or if the behaviour has caused increases in the hormone.

Evolutionary perspectives on personality

Evolutionary psychology maintains that there will be differences in behaviour between men and women in behaviour *domains* where they have faced different sorts of adaptive pressure (Buss, 1994). So for example men and women face differing information-processing in reproductive behaviour. For men, there is the question of assured paternity as fertilisation occurs internally within the female. Men who fail to solve this problem of whether they are the biological father risk investing resources into offspring that is not their own. For women, the problem is securing reliable sources that will support them and their child through pregnancy and the period immediately after. Evolutionary psychologists argue that it is these differing needs across the genders which motivate different types of personality development. So it is different biological differences that might account for why people have different personalities. Such biological differences can also shape within-sex differences in personality too (see Focus point 29.4). For example, a muscular man might be more confident using confrontational or aggressive behaviour to achieve his goals than a skinny one (as he has more muscles and is physically stronger and more intimidating). The skinny one might have too much to lose to employ such a confrontational approach to life; after all he has not got the physical muscle to support or defend himself. Instead, the skinny man may opt for a more cooperative approach which does not have to rely on physical presence or fitness. So through the processes of reinforcement and punishment we learn what we can and cannot do based on our biological makeup. Tall people have a greater chance of being more successful in playing basketball, a short person might be loud as they feel they need to be heard if they cannot be seen, for example.

FOCUS POINT 29.4

Sex differences in personality

Are women from Venus and men from Mars? Not exactly. We often hear that men and women are different and think differently. This may be the case at times. Men are seen to be more individualistic in their relationship with their environments, whereas in general women tend to be more collective and to foster more social networks (Triandis et al., 1990).

What we are not reminded of as often, however, is that on closer examination there is greater within-sex difference in personality than there is between the sexes (Griffen, 1991). For example, Harris and Schwab (1990) report that individuals with high levels of masculinity (regardless of whether they are male or female) seem to experience lower levels of depression than those who score more highly on femininity.

So rather than two potential planets, we may have a whole number of planets reflecting the different personalities that are evident both across the sexes and within them.

Behavioural genetics

What is the role of genetics in influencing personality? The human genome was first drafted in June 2000 and it refers to the complete set of genes that humans possess (between 30,000–50,000 genes). Most of these genes are shared

RESEARCH METHODS BOX 29.2

How do geneticists research genetic influences on personality?

Behavioural geneticists employ the notion of heritability. Heritability refers to the extent to which genetic inheritance is responsible for the variability (the degree to which we differ) of a trait in a population of people. So how much of the variability in scores on an aggression test given to people might be accounted for by their inherited differences in aggression from their parents?

There are two general methods that have commonly been employed by behavioural geneticists investigating the genetic basis of personality. These are called twin studies and adoption studies.

Twin studies investigate the similarity of identical (monozygotic, or MZ) twins – who share 100% of their genetic material – and fraternal (dizygotic, or DZ) twins – those who develop from two separate eggs and are no more related than normal brothers and sisters (i.e. they share only 50% of their genetic material) – in terms of how similar or dissimilar their personalities are.

Stein et al. (2002) examined the heritability of negative evaluation fears by using a twin sample (437 twin pairs aged between 18 and 86 years). Genetic correlations between twin scores on submissiveness, anxiousness and social avoidance facets of a personality test were high. A study in Germany by Borkenau, Riemann, Angleitner and Spinath (2002), testing 525 identical twins and 268 fraternal twins, reported that identical twins were more alike in their personalities than fraternal twins.

Adoption studies attempt to see if identical twins who have been adopted by different families differ in their personalities. (Obviously researchers cannot make this happen – it would be rather unethical to storm into someone's house, take a set of twins, purposely separate them and give them to two different families to see how their personalities develop. Instead they have to wait for natural separations of twins from their natural parents for whatever tragic reason.)

If researchers observe that the separated adopted twins are still similar in their behaviour as they grow up, this would suggest a strong biological underpinning to personality manifestation (as they share the same biology but have different environments). If, on the other hand, they grow up to have different personalities, this would suggest, instead, that the environment is more influential in shaping personality.

Bouchard et al. (2003), in a study called the Minnesota Study of Twins Reared Apart, found that there was still evidence of strong similarities in personality between identical twins who had been reared apart. Bouchard also found that separated fraternal twins do not exhibit similarities to the same extent as separated identical twins.

Similarly, Pederson et al. (1988) reported that of 99 separated identical twins and 200 fraternal twins, compared with equivalent numbers of non-separated identical and fraternal twins, separated twins had more dissimilar personalities. Thus identical twins reared apart appear to have more similar personalities than fraternal twins reared apart.

The similarity between parents and children might also reveal something of the genetic bases of personality. It has been interesting to note that the behaviour of adoptive children in general resembles more their biological parents' behaviour than that of their adopted parents (Rowe, 1990; Pederson, 1993).

Adoption studies have a number of recognised methodological weaknesses, however. It is assumed that the adoptive children, their adoptive parents and their circumstances are representative of the general population. But how can we be sure that people who adopt children are similar to those people who do not seek to adopt?

A second problem is the placement of the children themselves into an adoptive environment. Children who are placed with adoptive parents that are matched closely to their biological parents (as often happens) confuse matters further. Are the children behaving as they do because of their genes (sharing similar genetic make-up with their biological parents) or because of environmental influences, as their adoptive parents are so similar to their biological parents. It would become difficult to unravel this question.

Photo 29.2 To what extent do our genes influence our personalities?

commonly between all humans, this is why we physically resemble one another in our main features.

However, a small number of genes are different for different people (hair colour for instance). So while we have the sequence for our DNA we do not as yet fully understand the role these genes play in such things as behaviour, cognitive ability and personality.

Work in this area is attempting to determine the extent to which individual differences in personality are determined by environmental or genetic factors. This is arguably one of the most controversial areas of psychology for a number of reasons. If scientists can identify set genes that are related to personality then these findings might be used for political purposes. For example, if we found that addiction was related to a specific gene it *could* be argued that rehabilitation of drug and alcohol addicts may represent a thankless task because such programmes cannot override a genetic basis for this behaviour.

There is also concern that if scientists identify certain behaviours with the presence of certain genes this will lead to misuse. For example, if criminal behaviour is related to the presence or absence of a specific gene, this may raise concerns that such information could lead to genetic screening at birth. This is known as *eugenics* and it espouses the view that we can design the future of the human race by encouraging people to reproduce in a way which promotes 'so-called' desired traits and discourages reproduction of 'undesired' traits. The Nazi philosophy during the Second World War, for example, reflected this extreme view.

However, just because a personality trait is identified with a certain gene it does not mean the environment cannot play a role in how this behaviour is shaped also (see Research methods box 29.2).

Molecular genetics

Most recently biological research into personality has moved away from the issue of whether genes influence personality towards a much more focused set of questions such as 'how much' they influence personality and 'which precise genes' influence which behaviour. One of the main areas in which this is presently being applied is in the search for genes that are associated with genetically influenced disorders. So families with a history of these disorders are studied, blood or saliva is taken from those members of the family who have the disorder and those who do not have the disorder so that a DNA comparison can be made.

Other biological indicators of personality

Research on hormones and brain hemisphere use has also been used to investigate influences on personality. For example, Compton et al. (2003) investigated hemisphere involvement in emotional people. Results indicated that brooding and dwelling on the negative may be associated with decreased left hemisphere involvement, whereas openness to emotion may be associated with increased right hemisphere involvement. Other areas of investigation involving biological indicators of personality differences concern blood sugar levels. Svanborg (2000) investigated blood glucose levels and personality. Results indicated that in males, low blood glucose is associated with extroverted and impulsive, acting-out behaviour that includes breaking societal norms. Such studies highlight the different kinds of research exploring the biological link to personality.

Evaluation of the biological approach to personality

Theoretical concepts do not have a physical existence and so are difficult to prove or disprove. One main advantage in the biological approach is that physiological characteristics can be reliably measured (the brain, genes and blood are all physical entities). Brain activity and differences can be taken via a positron emission tomography (PET) scan, which is a powerful brain-imaging technique. For example, Johnson et al. (1999) have shown that extroverts might seek more because their normal brain arousal (as measured via a PET scan) was relatively low (in the frontal lobe area) compared with introverts, which were higher. Introversion, by the same token, was associated with increased blood flow in the frontal lobes and in the anterior thalamus. So in this case a direct physiological indicator has demonstrated a difference in an aspect of personality.

The biological approach in terms of hormone and brain activity offers interesting insights into how biology is linked to the expression of personality, but there is a danger here that the complexity of human nature is forgotten in such a specifically focused area. Bunge (1990) among others would argue that reduction to biological processes cannot fully explain personality. Behaviour is rooted in a rich cocktail of influential factors, with biological indicators being one along with others that can be equally as powerful – such as cognitive processes or environmental pressures.

The main problem with the biological approach to understanding personality is that a number of misconceptions have become attached to this view (see Applications box 29.1). There is the misconception that

Photo 29.3 Brain activity and differences can be monitored using PET scans in an effort to explain differences in personality.

APPLICATIONS BOX 29.1

Applications of personality research

Personality research has been applied to many areas of human behaviour. Presented below are research findings snapshots from just three areas of application.

Personality and health

Patients who demonstrate 'fighting spirit' in response to cancer diagnosis seem to fare better than those who do not. Indeed, cancer patients who gave higher ratings of helplessness and negative beliefs about their future had poorer outcomes (Goodkin et al., 1986).

Personality seems to play an influential role in the post-treatment stage too. Allison, Guichard and Gilian (2000) investigated the role of dispositional optimism (DO) as a predictor of health-related quality of life (HRQL) in a sample of stomach cancer patients. Following treatment, optimists reported better role and cognitive functioning, and less pain.

Personality and criminal behaviour

Mak, Heaven and Rummery (2003) investigated the impact of personality factors on self-reported delinquency among 224 male and 196 female Australian high-school students. Results indicated that the strongest predictor of delinquency among both males and females was Eysenck's psychoticism factor, and that extroversion scores predicted delinquency – but only for males.

Nussbaum et al. (2002) reported personality differences in violent, non-violent and sexual offenders incarcerated at a medium-security federal penitentiary in America. Violent offenders were found to be more impulsive and less empathic than non-violent offenders. Sexual offenders were found to be less impulsive, more empathic and more attached than non-sexual offenders.

Personality and television violence

Haridakis (2002) examined whether several viewer personality characteristics (disinhibition and locus of control) mitigated how people view and respond to watching television violence. Results supported the notion that individual characteristics and expectations influence the effects of exposure to televised violence.

Kiewitz and Weaver (2001) explored the short-term impact of exposure to violent mass media content while accounting for personality (i.e. trait-aggression). Following exposure to either a violent or non-violent film, 268 participants reported their perceptions of violent interpersonal incidents described in four written scenarios. High-scoring trait-aggressive individuals generally displayed more callous and hostile tendencies in their perceptions of interpersonal conflicts than low-scoring trait-aggressive individuals. Moreover, high-scoring trait-aggressive males were found to be most extreme in reporting aggressive thoughts and actions. These studies suggest that personality can be influential in how we interpret and respond to social stimuli.

heredity means permanence – this is not the case as people can change over their lives due to environmental factors (such as changing jobs, becoming a parent etc.). There is the misconception that everyone inheriting a trait will act in the same way. Again this is untrue. Only twins inherit all the same genes; the majority of us inherit different combinations of traits. So two individuals might inherit that particular trait, but they will also inherit other different traits from one another. So genes can be seen as a chemistry set – mix the same substance with lots of different substances and you'll get different results each time.

Self-test:

- What has arousability theory said about the bases of personality?
- What is Jeffrey Gray's (1985) reinforcement sensitivity theory?
- What effect do hormones have on personality?
- Have twin studies revealed anything significant about the biological underpinning of personality?

Summary

We have seen then how research within this field has been directed by a number of significant questions regarding the nature of personality. The term personality refers to the unique sets of psychological and behavioural characteristics/dispositions by which individuals can be compared and contrasted with others. There are five main approaches to personality research: psychodynamic, humanistic, trait, cognitive-behavioural and biological. Contrasting factors across gender and culture tend to exert some influence on the development of personality. Biological factors also offer some insight into how personality develops. Applications of personality research are making positive contributions to our understanding of many applied areas of psychology (such as health, criminal behaviour and social issues).

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the main personality theories and evaluate their contribution to our understanding of personality.
2. Understand the role that biology might play in influencing personality.
3. Describe how social influences might impact on personality.
4. Describe some of the ways in which personality research has been applied to contemporary social issues.

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30

Intelligence

Route map of the chapter

This chapter is divided into three parts. The first part deals with the history of intelligence research and the issue of defining it as a psychological concept. The second part considers whether intelligence is a single ability or is made up of smaller, more specific intellectual skills. Finally, we will discuss the influence of heredity and biological factors on intelligence. Throughout this chapter we will aim to evaluate the main theories of intelligence and their contribution to our understanding of human intellect. We will consider how social influences might impact on intellectual development and review the research on racial and gender aspects of intelligence.

Introduction and defining characteristics

Intelligence is a fundamental concept in our time. The term has become a convenient evaluative expression covering a wide variety of domains (for example, singers are described as having intelligent voices, footballers as having intelligent feet, horses as running intelligent races) (see Activity box 30.1). However, while many people use the term in their daily language in a way that suggests there is agreement about what intelligence is, the truth of the matter is that psychologists cannot agree!

The *Oxford Dictionary* defines intelligence as ‘quickness of understanding’, while the *Cambridge Advanced Learners’ Dictionary* defines it as ‘the ability to learn, understand and make judgements or have opinions that are based on reason’.

However, psychologists do not yet agree on a universally acceptable definition. While they may agree that intelligence is not a physical entity but rather a concept (idea or notion), they disagree on what that concept is. For example, as we shall see later in the chapter, some psychologists see intelligence as being a single aptitude, while others see it as representing a cluster of aptitudes or mental skills. Other psychologists look to definitions of intellectual inheritance, contrasting with those who view intellect as a learned behaviour (see Focus point 30.1). Definitions of intelligence over the last century can be seen in Table 30.1.

The problems with defining intelligence are in part due to how we define intellectual behaviour as part of everyday life. In other words, the term intelligence is socially constructed, that is, that cultures and groups of people see intelligence as being whatever attribute leads to success within that group (Sternberg and Kaufman, 1998). In the western world, we take for granted that our definition of intelligence – which revolves around high academic attainment – applies the world over. As we shall see later in this section, this is not the case. For example within the Sahara regions of North Africa, intelligence might be considered in the context of being able to find water, in the jungles of Brazil the identification of edible plants is viewed as a sign of intellect.

ACTIVITY BOX 30.1

Are you as intelligent as you think?

Take a few moments to judge how intelligent you consider yourself to be. You probably made judgements about your intellect, maybe on the basis of your education or your general knowledge skills. Now also ask yourself the following questions.

1 Can you change the engine on a car?
2 Could you use the stars to navigate your way home if you got lost?
3 Do you know how many square feet of tiles you would need to cover your bathroom?
4 Can you walk a tightrope?

If you cannot do any of these things, then would you be considered unintelligent?

Another distinction that is evident is the difference between academic and non-academic definitions of intelligence. Sternberg and Detterman (1986) asked experts working in the field of intelligence for their views on what intelligence was. Learning and adaptive abilities were important, as was the ability to understand and control oneself. This contrasted with non-experts’ definitions, which

FOCUS POINT 30.1

Intelligence defined

A working definition that would encompass both academic and non-academic definitions of intelligence, and apply to people worldwide and from all geographical contexts, might be that intelligence is the ability to learn from experience, apply knowledge to solve problems, and to adapt and survive in different environments (social and geographical).

In more simple terms, then, intelligence equals survival. If we exhibit intelligence, then we will survive and prosper within the social and geographical contexts we encounter. This does not mean just finding food and shelter, but building successful social relationships with those individuals that share our community.

TABLE 30.1 HISTORICAL DEFINITIONS OF INTELLIGENCE

1916	Binet and Terman: motivation and adaptation to the environment
1923	Spearman: understanding relationships between objects and understanding correlations
1943	Stoddard: taking on difficult tasks and carrying them out despite resistance
1955	Freeman: adaptation to the environment, the ability to learn, the ability to think abstractly using symbols
1958	Wechsler: to act rationally and purposefully, and interact with the environment
1973	Das: planned behaviour based on desired goal
1979	Humphrys: acquiring new information, retrieving it when necessary and applying it to new situations
1983	Gardner: problem-solving and acquiring new knowledge
1986	Sternberg: adaptation to and selection of environments relevant to one's life

TABLE 30.2 THE THREE TYPES OF INTELLIGENCE DEFINITIONS

INTUITIVE DEFINITIONS

These maintain that intelligence relies upon experience and judgement. Such definitions can be further subdivided into:

- those concentrating on adaptation to the environment
- those emphasising the capacity for learning
- those stressing the capacity for abstract thinking.

LOGICAL DEFINITIONS

These focus on what the actual word 'intelligence' implies to people. Such an approach recognises that different groups of people will use different words and abilities to describe intelligence.

EMPIRICAL DEFINITIONS

These start from facts that have been scientifically established (for example, the observation that many academics lack practical intelligence) and try to derive further hypotheses from these facts by seeking evidence to test out these hypotheses via research and observation.

emphasised practical problem-solving, verbal ability and social competence as indicators of intelligence (Sternberg et al., 1981). This distinction raises the issue of how we go about defining intelligence. Do we define it as higher intellectual functioning or do we define it in terms of successful day-to-day survival?

In terms of academic investigations of intelligence, there have been three main types of definition and these can be seen in Table 30.2.

History and origins of the scientific study of intelligence

A history of the debate about human intelligence can be traced back over the past 25 centuries. Table 30.3 summarises those who have been influential in discussing the nature of intelligence over this period.

Self-test: Describe the different ways in which psychologists have defined intelligence.

TABLE 30.3 **THE LEADING INDIVIDUALS ASSOCIATED WITH THE ADVANCEMENT OF A SCIENTIFIC FOCUS ON INTELLIGENCE**

Socrates (fourth century BC) Greek philosopher. He hypothesised that individuals have inborn, or innate, knowledge systems that are inherited. He viewed intelligence not as a single construct but as a sum of several different capacities.
René Descartes (seventeenth century) French philosopher and mathematician. Intelligence was mostly God-given; knowledge was thus innate and resided in the mind, so was without physical attributes, and was separate and distinct from the body. The argument that the mind and body are separate entities is called 'dualism'.
John Locke (seventeenth century) British philosopher. Disagreed with Descartes about intelligence being innate. Saw the mind as a blank piece of paper that was to be filled through experience and interaction with one's environment. He is credited with founding the British empiricists, who argue that experience is the basis of all knowledge.
Immanuel Kant (eighteenth century) German philosopher. Attempted to bring together the two opposing stances taken by Descartes and Locke. Kant argued that the human mind comes ready-furnished with the ability to make 'categories' (such as relation, time and space, and quantity). The human mind perceives the world in ways that are determined by its innate categories. Thus we all see the world in terms of time, space, quantity and quality. Kant also suggested that we make mental representations of our world through 'schema'.
Wilhelm Wundt (nineteenth century) German academic professor. Credited with establishing the first experimental psychological laboratory. From work in his laboratory, Wundt concluded that a number of basic mental processes were required to solve problems. Some of these he named as perception, cognition, judgement and reflex.
Francis Galton (nineteenth century) Half-cousin to Charles Darwin. Proposed that intellect was inherited. He studied the children of notable and eminent men in Victorian society, and observed that such men bred intelligent offspring. He focused on sensory indications of intelligence, such as pitch detection, and colour and weight differentiation, but was criticised for not taking into account that such eminent families at that time could provide educational stimulation to their children when the majority of the population could not afford to. Galton is credited with coining the word 'eugenics' (enhancing humans' mental abilities by improved selective breeding).
Alfred Binet (twentieth century) French psychologist. Opposed to the sole use of the sensory skills approach pursued by Galton. He also focused on what he called higher-order skills, such as reasoning, invention and comprehension. In 1904 the French Ministry of Public Instruction commissioned Binet to devise a test to identify children who were not learning in ordinary schools but who might benefit from remedial education. Binet and Theodore Simon published their first tests of children's mental ability in 1905 (Binet and Simon, 1916; 1973). (See Focus point 30.2 for examples taken from this test.)
Edward Thorndike (1900–1940s) American educational psychologist. Reported via his work with animal behaviour that repetition increases the rate of problem-solving ability. Saw the mind as a blank sheet of paper which, via learning and exposure to environmental interaction, could acquire intellectual skills and competences.

Intelligence: a general ability or a number of defined abilities?

Modern theories of intelligence consider the question of whether intelligence is a single mental ability (you are either intelligent or not) or whether a number of specific abilities make up overall intellectual ability. If intelligence is comprised of a number of abilities, there is also the question of what these specific abilities might be. The distinction is a vital one. If we are to view intelligence as a single trait, then someone who performs badly on a test measuring that trait could be labelled as unintelligent. However, if intelligence is made up of sub-abilities then a poor score does not necessarily mean that person is unintelligent in everything they attempt to do.

In addressing these issues, contemporary research on intelligence originates from two main perspectives:

- the psychometric perspective
- the cognitive and contextual perspective.

We will explore these perspectives and their respective theories in relation to the question of whether intelligence is a single ability or if it is a reflection of a finite number of specific abilities.

Psychometric perspective

Most standard IQ tests and intelligence tests have been forged out of psychometric approaches to understanding the structure of intelligence (see Definition box 30.1). While we will consider the psychometric method in more detail in a separate section, we will describe the main psychometric theories of intelligence here. The psychometric approach to intelligence is among the oldest of approaches and dates back to Galton's (1883) psychophysical account of intelligence (see Focus point 30.3).

DEFINITION BOX 30.1

IQ

Intelligent quotient is defined originally as the ration of mental age (ma) to chronological age (ca) multiplied by 100 (IQ = ma/ca × 100).

Let us now consider some of the contributions of psychometric theories in understanding the structure of intelligence.

Charles Spearman (1863–1945): two-factor theory

Spearman was a statistician at the turn of the last century. He observed that individuals who tended to do well on one test of intellectual ability tended to do well on other tests related to intelligence as well. He also helped develop factor analysis in his work. So he suggested that different abilities seemed correlated with one another and therefore under the direction of the same system. Spearman called this general overarching system general intelligence, g (see Definition box 30.2).

FOCUS POINT 30.2

Sample tasks from Binet and Simon's mental tests

Binet and Simon's tasks (see Table 30.3) were organised depending on the age category of the child, as outlined below.

Four years of age

- Name objects (key, knife, penny)
- Repeat three figures
- Compare the lengths of two lines

Eight years of age

- Compare two objects from memory
- Count down from twenty to zero
- Repeat five numbers

Twelve years of age

- Produce more than 60 words in three minutes
- Define three abstract words
- Comprehend a jumbled-up sentence

FOCUS POINT 30.3

Do you have more than one intelligence?

Think about the skills you have. Are you good with numbers or do you need a calculator? Are you good at languages or do you have difficulty mastering just one? Are you musically minded or do your efforts to hum in the shower sound more like those of a drowning ostrich? Are you good with mechanical things or if you took your car apart and put it back together would you end up with two smaller cars, neither of which worked?

Chances are there are few of you reading this who are good at all the things I have just mentioned. If you are one of them I guess you are feeling fairly proud of yourself right now! But are the skills I have just mentioned indicators of separate forms of intelligence or are they all part of a general intellectual ability? Do we have a single intelligence or multiple intelligences?

DEFINITION BOX 30.2

General intelligence, *g*

A general intelligence is believed to underlie specific mental abilities. Spearman saw this as a neurological-based power that drives the ability to engage and complete intellectual activity.

While Spearman believed that our intellectual ability is represented by *g* he also suggested we have a number of specialised skills or abilities which he labelled *s*. These were the specific skills and knowledge needed for particular mental tasks. He believed *g* could be used to improve our abilities in these other areas. So someone who had a high *g* but an average ability in maths could divert some of their *g* intellect to improve their maths standing slightly. Thus *g* was the crucial component of whether someone was intelligent or not! *g* represented a single intelligence.

Thurstone (1887–1955): factor analytic theory

Thurstone opposed Spearman's assertion that there was a single underlying 'force' guiding intellectual ability. Thurstone employed factor analysis to analyse correlations among 56 intelligence tests to see if there was any related underlying factor. His work did not reveal a single dominating *g* factor. While he did not deny *g* existed, he did not believe it was as important as Spearman suggested. He did, however, report finding around seven groupings or clusters of what he called primary mental abilities (numerical ability, verbal fluency, spatial visualisation, reasoning, perceptual ability, verbal comprehension and memory). As a result, Thurstone believed that intelligence was not a united single entity but a linked system of mental abilities.

J. P. Guilford (1967): structure of intellect model

Guilford's model (see Figure 30.1) did not believe in the importance of *g*, neither did it propose a single concept for intelligence. His model of intellect contained 120 factors in three dimensions – often represented as a 4 × 5 × 6 cube. Guilford visualised intelligence as having a number of subcomponents all of which contributed to an individual's intellectual ability. So intelligence comprised a single concept subdivided into different aptitudes.

Philip Vernon (1950): Hierarchical model of intelligence

The British psychologist Philip Vernon suggested that *g* intelligence was made up of two groupings of abilities. Higher order abilities, called *v:ed*, generally reflected educational type abilities (language, numbers etc.) and *k:m*, abilities associated with spatial ability and mechanical understanding.

John Horn and Raymond Cattell (1966): fluid and crystallised intelligence

Horn and Cattell agreed with Spearman. They proposed two components to intelligence, but rather than *g* and *s*, they labelled them fluid intelligence and crystallised intelligence. Fluid intelligence (*gf*) was the ability to think logically and to relate concepts through reasoning. Crystallised intelligence (*gc*) refers to specific (or set) knowledge as a result of the application of fluid intelligence to a task. So an ability to engage in multiplication is a form of crystallised intelligence in the western world. Horn (1989) added to the earlier work on this model and suggested a hierarchical basis for the two *gf* and *gc* systems of intelligence in his gf–gc theory of intelligence. Horn also recognised that the expression of these abilities 'are outcroppings of distinct influences operating through development, brain function, genetic determination, and the adjustments, adaptations, and achievements of school and work' (Horn, 1989, 76).

Carroll (1993): hierarchical model of intelligence

Carroll analysed more than 460 intelligence data sets obtained between 1927 and 1987, involving more than 130,000 people from varying countries. Carroll's model of intelligence is a hierarchy comprising three levels, which he called strata. The first stratum includes many specific abilities (e.g. spelling), the second stratum includes various group factor abilities (e.g. flexible thinking) and an accumulated knowledge base. Lastly, the third stratum is a single general intelligence, much like Spearman's *g* factor. (See Research methods box 30.1 for more on research in to intelligence.)

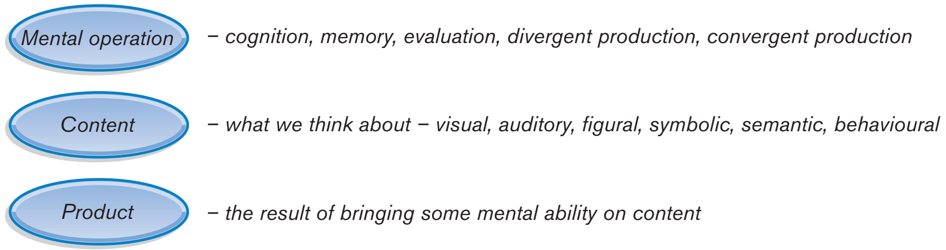
Mental operation
– cognition, memory, evaluation, divergent production, convergent production
Content
– what we think about – visual, auditory, figural, symbolic, semantic, behavioural
Product
– the result of bringing some mental ability on content

Figure 30.1 Guilford's structure of intellect model (1967)

RESEARCH METHODS BOX 30.1

Researching intelligence

There are several research methodologies that can be employed to investigate the issues (such as the composition of intellect) and questions (such as 'To what extent is intelligence inherited?') discussed in this chapter.

Longitudinal studies

These enable the observation of the development of intelligence over a time period, usually starting in childhood and continuing into adulthood. This method is useful for studying how intellectual ability develops and how life events might impact on intelligence. This type of research can be costly and time consuming.

Cohort studies

These are longitudinal studies involving everyone from a particular group. For example, all babies born in the first week of March 1968 would be a cohort group for a longitudinal study. The weakness with this type of study (as with the longitudinal study design) is that people drop out along the way (they may die or voluntarily remove themselves from the study). The problem here is that the people who drop out could be very different to the people who stay in the study, and this will obviously bias any conclusions we might make at the end of the study.

Cross-cultural studies

These allow researchers to compare intellectual ability across different groups/cultures worldwide. This method is useful in exploring both the development of intelligence within individuals from different groups and also the potential differences in intellectual abilities from a cross-cultural perspective. This method is not without its drawbacks. It is expensive and also requires accuracy in universally translating concepts and questions (for example, asking people to define sexual harassment would be difficult as this means different things to different people from different cultures).

Twin and adoption studies

These are employed to investigate whether aspects of intelligence are genetically inherited. This gives researchers an opportunity to focus on the relative importance of genetic and environmental markers of intellect. One of the drawbacks here is that twins that are adopted are either placed in the same adoptive environments or, if adopted by separate adoptive families, these are often comparable in terms of socio-economic profile. So even though twins may go to different families in different locations, these families (due to the nature of adoptee profiles) are often similar in socio-economic status. The twins, then, are raised in similar environments, which makes it difficult to separate clearly the impact of environment and/or genetics on intellectual development.

Evaluation of the psychometric approach

At least some psychometric theories agree with each other in conceptualising intelligence as a single construct, while others suggest intelligence is comprised of different sub-factors. It would seem to some extent that theory is often influenced by the type of research statistical tool employed:

> *Given the same set of data, it is possible, using one set of factor analytic procedures, to come up with a picture that supports the idea of a 'g' factor; using another equally valid method of statistical analysis, it is possible to support the notion of a family of relatively discrete mental abilities.*
>
> (Gardner, 1993: 17)

Critics of the statistically based approach to intelligence also suggest that it is limited in its focus and that it takes no account of context. In other words, the ability to produce intelligent behaviour is a joint product of knowledge and resources available (within the person, from others or from the environment (Salomon, 1993)). For example, consider learning a new language. People of equal language ability may have learned through a variety of means – some may have learned by going to a place where the new language is spoken, others have used books and audio-visual education, while others may have used a combination of both.

Self-test:

- What were the factors of Spearmen's two-factor theory of intelligence?
- What have been the four main research methodologies that have been used to investigate the nature of intelligence?

Intelligence: a universal concept or culture specific?

Cognitive or information-processing approaches to intelligence investigate what mental processes (such as memory, attention, processing speed) contribute to intelligent behaviour. Do differences in these abilities lead to differing intellectual ability? In essence, these cognitive theories attempt to evaluate what cognitive factors might to intellectual functioning. For example, Earl Hunt (1983) reported that individuals with greater attention spans seem to score higher on intelligence tests whereas Eysenck (1986) suggested that intelligence was error-free cognitive

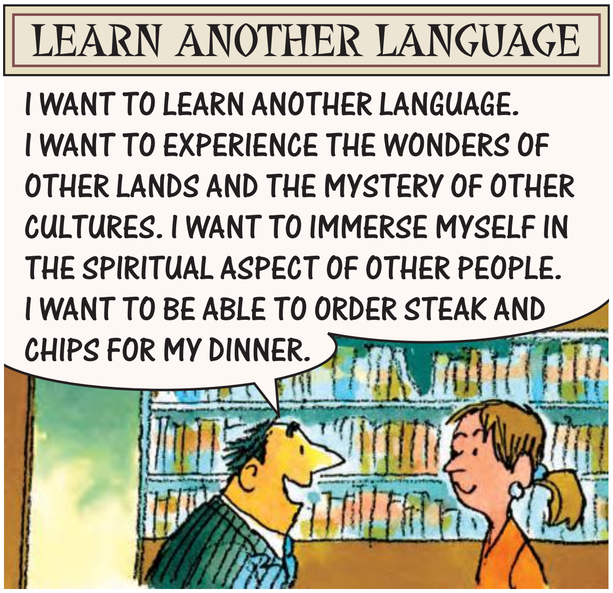
LEARN ANOTHER LANGUAGE
I WANT TO LEARN ANOTHER LANGUAGE. I WANT TO EXPERIENCE THE WONDERS OF OTHER LANDS AND THE MYSTERY OF OTHER CULTURES. I WANT TO IMMERSE MYSELF IN THE SPIRITUAL ASPECT OF OTHER PEOPLE. I WANT TO BE ABLE TO ORDER STEAK AND CHIPS FOR MY DINNER.

Photo 30.1 Intelligent behaviour is needed by some to navigate potentially hazardous environments and elements.

processing. However, it has been suggested that only one-quarter of the variation evident in people's performance on intelligence tests is accounted for by differences in cognitive processes (Miller and Vernon, 1992).

Cognitive-contextual theories of intelligence deal with the way that cognitive processes operate in various

TABLE 30.4 GARDNER'S MULTIPLE INTELLIGENCES

Intelligence	Description
LINGUISTIC	The ability to use and learn languages. Poets exemplify linguistic intelligence, and it is a useful asset for lawyers and journalists.
LOGICAL–MATHEMATICAL	The ability to manipulate numbers and engage in abstract reasoning.
SPATIAL	The ability to perceive visual or spatial information and mentally to manipulate shapes and objects.
MUSICAL	The ability to identify, create and communicate rhythm, pitch, tempo and sounds.
BODILY–KINESTHETIC	The ability to control fine and gross motor actions, eye–hand coordination, athletics, dexterity and dance.
INTERPERSONAL	The ability to recognise correctly and make distinctions between, among other things, feelings, beliefs and intentions.
INTRAPERSONAL INTELLIGENCE	The ability to distinguish and recognise our own feelings, thoughts and actions.
NATURAL INTELLIGENCE	Recently added by Gardner, this is the ability to classify plants and animals in terms of their usefulness and potential danger for survival purposes (e.g. the ability to identify poisonous plants).

environmental contexts. As well as considering the nature of intelligence, cognitive-contextual theories try to understand what cognitive abilities in what environments are conducive of intellectual behaviour. For example, getting a pass mark in maths might be considered a marker of intelligence for students in Britain, whereas using the stars to successfully and safely navigate treacherous reef-filled seas is considered to be a sign of intelligence for night fishermen in New Guinea. So if intelligence is a single construct as defined by people like Spearman, then we should find that this definition is applicable to every person all over the world and therefore would not be measured by individual skills but by the efficiency and effectiveness of the more basic cognitive processes.

Howard Gardner (1983): theory of multiple intelligences

While the psychometric theorists had debated how intelligence might comprise multiple abilities, Howard Gardner went beyond this suggestion and proposed that we possess independent intelligences. Rather than arguing that there were multiple abilities, he proposed that there were multiple intelligences that operated independently from one another. He did not recognise the existence of a single intelligence. Working with brain trauma patients, he observed that individuals who had suffered brain injury might have diminished ability in one area, but not all areas. His evidence also stems from his work with people with savant syndrome (individuals who score poorly on intelligence tests in general but who possess exceptional skills in one ability). People (usually males) who suffer from this syndrome often have poor language ability but may have incredible ability in music, art or mathematics. Dustin Hoffman portrayed the fictional savant, Raymond Babbit, in the film *Rain Man*.

Gardner suggests that 'the human mind is better thought of as a series of relatively separate faculties, with only loose and non-predictable relations with one another, than as a single, all purpose machine that performs steadily at a certain horsepower' (Gardner, 1999: 32).

Gardner also did not think that the psychometric definitions of intelligence were flexible enough to represent the different abilities around the world that are considered by different groups to be indicative of intellectual behaviour. Based on his observations of brain trauma patients and of different ethnic groups' definitions of intelligent behaviour, Gardner offered a new model of intelligence. He proposed the existence of multiple intelligences (see Table 30.4).

Standard intelligence tests measure only the first three of the intelligences (as seen in Table 30.4) proposed by Gardner. Gardner argues that traditional tests are biased towards western definitions of intelligence and do not encompass the diversity of intelligences. Gardner proposed that whereas most concepts of intelligence had been ethnocentric and culturally biased, his was universal and based on biologic and cross-cultural data, as well as on data derived from the cognitive performances of a wide array of people.

Critics, particularly those that favour the model of a single intelligence, argue that Gardner is confusing intelligences with *talents*, so that abilities in music and athletics for example are talents, not forms of intelligence (Scarr, 1989).

Robert Sternberg (1988): triarchic theory of intelligence

Sternberg agreed with Gardner that conventional notions of intelligence were too narrow. However, unlike Gardner

FOCUS POINT 30.4

Intelligence and context

Both Sternberg and Gardner, while not in total agreement in their definitions of intelligence, do agree on one thing: they both acknowledge that intellectual behaviour is context-driven to a large extent.

For example, you may achieve a first-class degree in psychology – an excellent academic achievement and measure of intelligence in the western world. On gaining your first-class award you decide to take a well-earned holiday – a trek across the Sahara. You arrive ready for your adventure and meet your guide. Midway into the month-long trek you awake to find that your guide has died in his sleep. You are alone in the middle of all that sand and weeks away from the nearest settlement. 'Aha,' you think, 'I have a first-class degree. I am quite intelligent. I should be able to cope.' But will your first-class degree in psychology indicate where the nearest water will be or what direction you should be heading or how to survive a sandstorm?

Macabre as this example is, it shows that some forms of intelligence are *context-specific*. Skills that are deemed indicative of intelligent-type behaviour in one group or one place are not necessarily useful to indicate intellectual functioning in another group or setting. Answering timed essay questions bears little relationship to being able to find water in a desert.

Indeed, other researchers have recognised that different climates and survival challenges could lead to different sets of aptitudes (Rushton, 1998; Lynn, 2001). So all the exams you sit might only be measuring part of your intellectual capacity. Your ability for practicality or survival is hardly tested, nor is your skill at being a member of a social group.

Should not a definition of intelligence include those areas of intellect that are important to us on a daily basis? After all, we will probably use our practical skills more than our essay-writing skills in life!

Sternberg believed that musical and bodily kinesthetic abilities are talents rather than intelligences. He viewed them as fairly specific and not essential for successful adaptation in most cultures.

For Sternberg, intelligence has three aspects. These are: analytic intelligence (academic-based problem solving of problems with a single right answer which are assessable through intelligence tests), creative intelligence (reacting to and producing novel ideas) and practical intelligence (required for day-to-day tasks that are often ill defined or have a number of potential solutions). Sternberg's theory, like that of Gardner extends the concept of intelligence beyond traditional academic definitions and reflects the use of intellect in everyday life (see Focus points 30.4 and 30.5).

Summary

Psychometric and cognitive-contextual perspectives therefore seek to understand intelligence in terms of underlying hypothetical constructs, whether these constructs are psychometric factors (e.g. mathematical ability), cognitive processes (e.g. memory retrieval) or are constructs defined by environmental context (e.g. survival and adaptation). These two perspectives also investigate the question of whether intelligence is a single construct or is a combination of specific intellectual abilities. Important debate also revolves around the question of whether the definition of intelligence should be flexible. Different cultures should have different definitions of what intellectual ability is and intelligence should be determined to some extent by the environment in which it is being used (and for what purpose).

There is one further issue driving psychological research into intelligence. This concerns the extent to which biological factors play a role in intellectual functioning.

Self-test:

- Briefly describe Howard Gardner's multiple intelligences.
- What are the main components of Robert Sternberg's triarchic theory of intelligence?
- What have been suggested as the main differences in intellectual ability between genders?

FOCUS POINT 30.5

Gender and race differences

On tests of general ability, or on summary scores of large test batteries, men and women tend to come out with about the same scores, although there are differences in some specific abilities (Carroll, 1993).

It is widely accepted that females score higher on average than males on tests of verbal abilities (Stumpf, 1995; Halpern, 1996), and that males score higher on average than females on tests of mathematical (Hyde, Fennema, and Lamon, 1990; Halpern, 1996) and spatial abilities (Masters and Sanders, 1993; Hedges and Nowell, 1995; Voyer, Voyer and Bryden, 1995). These differences also vary in size: differences in verbal and mathematical abilities are small; however, differences in spatial abilities and vocational information and aptitudes are moderate to large.

The issue of ethnic differences in intelligence has been an ongoing debate. It is acknowledged that there are observed ethnic differences in IQ, with consistent reports of poorer performance on intelligence tests in certain racial and ethnic groups (Herrnstein and Murray, 1994). However, several important points need to be raised when considering these results.

It has been shown that many students from disadvantaged families have lower confidence in their academic abilities (Steele, 1997). Individuals who are labelled as being less intelligent (by the media, their peers or even academics) could have low confidence in their academic potential and form a negative self-image of their worth. Under the principles of self-efficacy (as defined when we looked at personality in Chapter 29) this could be detrimental to their ability to learn and improve their intellectual standing.

For example, Mayer and Hanges (2003) found that black students reported themselves to be more threatened by completing an intelligence test (due, perhaps, to the pressure of stereotypical attitudes and negative labelling of black people and lower intelligence) than the white participants. Results of the test matched self-reported test anxiety levels, with the less threatened white participants scoring better than the more threatened black participants on the Raven Advanced Progressive Matrices test.

Another potentially important factor might be motivation and its relation to academic achievement. Peer, parental and cultural attitudes towards education could determine children's motivation towards learning. A study by Steinberg, Darling and Fletcher (1995) reported that students' academic performance matched the motivations of their parents towards academic skills. Those children whose parents were highly motivated for their children to do well did so, while those with parents who expressed less motivation for their children's academic levels did not do as well.

Lastly, Zuckerman (1990) is quick to remind us that, just as with gender differences, variation in intelligence is greater *within* ethnic groups than *between* them.

What role do biological factors play in the acquisition and operation of intelligence?

The biological perspective seeks to understand two questions. First, the extent to which biology plays a role in the acquisition of intelligence, through inheritance. Second, what parts of the brain are associated with intellectual functioning. Thus biological theorists seek to understand intelligence directly in terms of its biological bases without the use of intervening hypothetical constructs.

Intelligence, brain structure and brain size

Halstead (1951) was perhaps the first to focus on biological aspects of intelligence, suggesting that there are four biologically based abilities and that all four of these abilities can be traced to the functioning of the frontal lobes in the cortex.

Hebb (1949) distinguished between two basic types of intelligence: intelligence A and intelligence B. Intelligence A is innate potential; intelligence B is the functioning of the brain as a result of the actual development that has occurred. Hebb also suggested that these two intelligences were different from the intelligence as measured by conventional psychometric tests, which he labelled, intelligence C. Hebb suggested that learning encourages more and more complex connections among neurons which form the basis of intellect.

Luria (1973, 1980) continued the work on intelligence and brain anatomy by suggesting that the brain comprises three main components in relation to intellectual functioning: (a) arousal in the brain stem and midbrain structures; (b) sensory input in the temporal, parietal and occipital lobes; and (c) organisation and planning in the frontal cortex.

Willerman et al. (1991) correlated brain size (controlling for body size) with the Wechsler Adult Intelligence Scale (WAIS-R). They found that IQ was significantly correlated ($r = 0.65$ in men and 0.35 in women, with a correlation of 0.51 for both sexes combined) with larger brain size. But the question has been raised as to whether brain size causes higher intellect or intellect creates a larger brain size.

Some researchers have also reached the conclusion that intelligence is part of the nervous system. Jensen (1993) suggests that individuals who have higher *g* scores (general intelligence) have nervous systems that respond more quickly to stimuli and these individuals also possess more capacious short-term memory than those people with lower *g* scores.

Work on brain anatomy and neurology in relation to intelligence is ongoing and with the advance of new technology in this specialised area, I am sure interesting findings are still to come (see Focus point 30.6).

Acquisition of intelligence: behaviour genetics

Recall from the chapter on personality that behaviour geneticists attempt to determine the extent to which individual differences in personality and intelligence are determined by either environmental or genetic factors. The research literature in relation to intelligence is complex and again – as is that for personality – controversial (for the same reasons). The main question is to what extent do our parents' intellectual abilities reflect our own? How much of our intellectual abilities do we inherit from them?

FOCUS POINT 30.6

Neurological effort and intelligence

Some interesting research has been conducted by Haier and colleagues. Using positron emission tomography (PET) scan analysis, Haier et al. (1988) showed that intelligent people solving psychometric intelligence tests had lower cortical glucose metabolic rates than less intelligent people who did not solve as many tasks. This suggests that the more intelligent subjects needed to expend less effort than the less intelligent ones to solve the reasoning problems.

We need to exercise some caution with this interpretation as the causal direction of this research remains unclear. For example, one could as easily argue that the smart people expend less glucose because they are smart (and therefore do not need to think much), rather than that people are smart because they expend less glucose. As you have no doubt seen in other chapters, correlatory studies suffer from this inability to make a causal prediction.

The methods used to investigate this question are the same as those employed in personality research (e.g. twin and adoption studies). It has been found that identical twins reared apart, in separate homes and with different families, have strikingly similar IQ levels, with correlation of their IQs reported in some cases as high as .72 (Plomin, 1990). Even at a conservative estimate, advocates of the view that intelligence is inherited claim that about half the total variance in IQ scores is accounted for by genetic factors (Bouchard 1997; Loehlin 1989; Plomin 1997). This is a significant relationship, especially when research also suggests that the IQs of fraternal twins (non-identical) sharing the same household have a correlation coefficient of .60 and the correlation coefficient of the IQs of ordinary siblings (brothers and sisters) raised together is .47 score. The highest reported association in IQ scores is reported in identical twins reared together a correlation coefficient of .86 (Gardner et al., 1996).

Evaluation of behaviour genetic approaches

Critics of the behaviour genetic view argue that effects of heredity and environment cannot be easily or clearly separated from one another (Bronfenbrenner and Ceci 1994; Wahlsten and Gottlieb 1997). The methods of adoption studies have also been the focus of questioning, as many researchers have suggested that identical twins usually get adopted by matched type families (as was mentioned in the personality chapter) – which adds further to the confusion of separating out neatly environmental and genetic influence.

It is recognised that no matter how heritable intelligence is, some aspects of it are still malleable. Heritability of a trait is independent from its malleability. Height, for example, is 90% heritable and the best predictor of height is the height of an individual's parents. More recently, however, as a result of better nutrition and health care, average heights in industrial countries have increased during the 20th century. This shows that even highly heritable traits can be modified. This principle also holds true for intelligence. As we are presented with more and more opportunities to learn (for example all the information that can now be found on the world wide web) we would expect that the IQ average among the world's populations might also increase. (See Focus point 30.7, concerning emotional intelligence.)

Contemporary issues in intelligence

As well as the debate on the nature and acquisition of intelligence, other issues have recently been driving research in this area of psychology. These issues include questions concerning the stability of intelligence over time, diet and IQ and the application of intelligence testing as a useful prediction (of future intellectual behaviour) tool.

Intelligence across the lifespan

Does intellectual functioning change over our lifespan? If it is seen to change then this suggests that intelligence is not a stable construct. This could be due to either learning and the influence of our experiences throughout our lives (such as jobs, role changes, for example) or it might be due to our changing biological system (reduction in brain efficiency with age, cellular decay and reduced repair capability).

A sample of Canadian men's IQ was studied over a 40-year span between the ages of 25 and 65. Findings suggested that the stability coefficient of individual differences in these men over this period for verbal ability was around 0.9, but for nonverbal ability it was around 0.6. This finding implies that different aspects of human intelligence show different degrees of stability across adulthood. Schwartzman et al. (1987) suggest that verbal abilities and knowledge hold up well or increase until old age, although fluid intelligence decreases in most people after young adulthood. Abilities that are concerned with stored information and knowledge (crystallised intelligence) are more consistently stable over time than abilities that are concerned with thinking under time pressure with new materials (fluid intelligence) (Schaie, 1996). So, for example, older adults have in general less cognitive flexibility, are less likely to consider alternative solutions (Salthouse and Prill, 1987) and have less ability to focus attention than younger adults (Kramer et al., 1995).

Several factors could be linked to maintaining mental ability level, namely, being free of chronic disease, living in an intellectually stimulating environment (which will be defined differently by each individual), living with a partner of high ability, maintaining speed of information processing and being satisfied with life in middle age.

Bourne et al. (1997) suggested that childhood intelligence was a significant predictor of cognitive change in later life. Results from 91 participants (tested at 11 and then either at age 66 or 80) were in the direction that participants with lower childhood mental ability experienced relatively

FOCUS POINT 30.7

'Emotional intelligence'

In 1995, Daniel Goleman published a book called *Emotional Intelligence*. It was written for a non-academic audience and argued that mainstream psychology has ignored the ability to recognise one's own and other people's emotions. Goleman calls this emotional intelligence.

He argues that being able to regulate our own emotional behaviour (such as aggression, fear and jealousy) and to interact successfully with others on an emotional level is a form of intelligence. He cites the fact that many successful people would not score highly on standard intelligence tests, but instead have succeeded because they have successfully manipulated both their own and other people's behaviour.

Goleman's theory was met with a barrage of interest and criticism in equal measure. Presently, research in this area is directed at answering several fundamental questions.

First, 'Is emotional intelligence different from other factors suggested by previous intelligence theories?' The research literature (Schutte *et al*., 1998) would seem to suggest that emotional intelligence correlates negatively with alexithymia (limited emotionality – lack of empathy etc.).

Second, 'Is there a single emotional intelligence?' Research findings employing factor analysis indicate that emotional intelligence does seem to measure one single dimension (Geher et al., 2001).

Lastly, 'Is emotional intelligence a major facet of intelligence per se?' Research to date views emotional intelligence, at best, as a lower-order factor within intelligence and personality as a whole (Petrides and Furnham, 2001) and some would even argue that the concept of emotional intelligence falls into the hinterland of mainland intelligence (Gardner, 1999).

Photo 30.2

greater cognitive decline, whereas those of higher childhood mental ability showed improved performance. This result suggests that higher premorbid cognitive ability is protective of decline in later life.

Diet and IQ

McCall (1979) conducted a study on baby diet and later IQ. This prospective, blinded, randomised outcome trial, with follow-up of 98% of survivors still in Britain, the diet assigned to a premature baby for an average of just 4 weeks after birth had a significant effect on IQ – notably verbal IQ in boys – 7½–8 years later when IQ scores are highly predictive of subsequent ones. The findings suggest that suboptimal early nutrition in preterm infants can have a permanent effect on their cognitive function, emphasising the potential importance of dietary management decisions in this population. In biological terms, these findings offer support to the long debated hypothesis that nutrition during critical or vulnerable periods of brain growth may have lasting consequences for cognition and intellect. Other researchers (Dobbing (1981) and Smart (1977)) have demonstrated no link between childhood diet in infancy and later intelligence. For example Malloy and Berendes (1998) reported no difference in later IQ levels in those infants either breastfed or not 10 years previously.

Benton and Cook (1991) studied the effect of different dosages of vitamin and mineral allowance on 47 6-year-old children. Another group of children simply received placebo tablets (containing no vitamin or mineral content). The children completed four subscales of the British ability scales test and also completed delayed reaction time (RT) tasks, both before and after the diet period. The intelligence scores of the children taking the vitamin tablets increased while the scores of those taking the placebo declined, primarily on nonverbal rather than verbal measures. When faced with a difficult task, participants who had taken the active supplement were also more likely to concentrate on a task.

Intelligence in the workplace

There are many issues regarding psychometric testing of intelligence in relation to job selection (see Chapter 31 for more details). One important question that has been asked within occupational psychology is whether intelligent individuals gain higher status jobs. Research does seem to predict that high scores on intelligence tests correlate fairly well with subsequent occupational status (Cronbach, 1990; Robbins, 1991). However, there seems to be a less clear relationship between intelligence and how well you will perform in your job and motivation seems to be a better predictor of high performance (Robbins, 1991). It has been shown that there is little association between intelligence scores and sales performance in salespeople but more of one for intelligence scores and performance in managers, doctors, academics and lawyers (Jenson, 1980). More recently research has concentrated on specific abilities in relation to occupational success. For example, Ponomarenko et al. (1996) have suggested that three basic factors are distinguished in the structure of intelligence of successful Russian pilots in training. Sternberg (2002) has argues that successful leaders require some very specific intellectual abilities (in terms of logico-symbolic, spatial and working memory) such as a vision of where to lead people (creative intelligence) and how convince them that this is indeed where they need to go (practical intelligence)! (See Class activity box 30.1.)

Self-test:

- What have twin studies revealed about the nature of intelligence?
- What is emotional intelligence?
- What happens to intellectual ability as we get older?

CLASS ACTIVITY BOX 30.1

Intelligent activities

Ask the class to prepare list of activities that they consider examples of being intelligent. Then ask the class if these lists of words would still be considered examples of acting intelligently if we changed the environment. So how would these activities stand up in a classroom? What about in the middle of a jungle or a desert?

Ask one half of the class to prepare an argument debating how the environment might be an important factor in considering what intelligent behaviour is. The other half of the class should prepare an argument proposing that it is concepts such as 'capacity for abstract thinking', numerical and language skills that form the basis of what should be considered a measure of intellectual behaviour. Each half of the class makes a point in turn and a debate is started.

Summary

Intelligence refers to the ability to learn from experience, apply knowledge to solve problems and to adapt and survive in different environments (social and geographical). There are three broad approaches to intelligence research: psychometric, cognitive-contextual and biological. The need for intelligence to operate in context-specific situations might explain differences observed in intelligence across gender and culture. It has been shown that both the environment and hereditary factors influence intellectual development. Intelligence tests have been employed in occupational selection and screening and this will be discussed in greater depth in the following chapter.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the main theories of intelligence and evaluate their contribution to our understanding of it.
2. Evaluate the biological influences on intelligence.
3. Describe how environmental and contextual factors might impact on intellectual development.
4. Describe some of the ways intelligence research has been applied to contemporary life.

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31

Psychometric testing

Route map of the chapter

This chapter is divided into three sections. The first is a section on the different types of psychometric test. Attention will be given to the different types of intelligence and personality test. The second section covers the main underlying principles of psychometric tests and considers such things as standardisation, reliability and validity. The focus of the final section is on the limitations and criticisms of the construction and use of psychometric tests. This chapter aims to describe the main types of psychometric test and the principles that guide them. It also seeks to show examples of how these tests have been employed within the various disciplines of psychology.

What is psychometrics?

Psychometrics deals with the scientific measurement of individual differences (personality and intelligence). It attempts to measure the psychological qualities of individuals and use that knowledge to make predictions about behaviour.

The use of psychometric measurement illustrates a fundamental characteristic of psychological investigation. Psychology employs scientific methods to investigate its claims and psychometrics is one such method of scientific investigation. Indeed, Dawis (1992) suggests that the invention and development of psychometric tests in psychology is comparable in its impact as the invention of the microscope in biology.

We have seen in the previous chapters on intelligence and personality that people differ. Such differences have consequences for all individuals, whether they be in relation to their education, occupation or interpersonal skills. Being able to predict the best outcome from two or more situations is important. Choosing appropriate subjects to study at school, choosing an appropriate career and the ability for employers to choose the best applicant for a job or for promotion are, therefore, important decisions that have far-reaching consequences. Psychometric tests provide *standardised* techniques that we can use to make predictions about our choices (see Activity box 31.1).

What is a test?

Objectivity is where every observer of an event would produce an identical account of what took place (see Definition box 31.1). *Systematic* refers to a methodical and consistent approach to understanding an event. *Standardised* means observations of an event are made in a prescribed manner. In other words, any differences that are observed can be attributed to differences in test participants and not variations in the way in which the observations are made. For example, if two people were given a painting to assess, they would both use their own assessment methods and

ACTIVITY BOX 31.1

Remember all those exams at school?

Take a few moments to consider how intelligent you think you are. How have you come to this impression of your intellectual capacity? Probably the main source of your opinion of your skills and abilities has been through feedback: feedback from peers and family, and feedback from standardised academic tests. Yes, that's right – all those long years spent at school and your academic effort was measured by psychometric principles.

Cast your mind back to Chapter 30, on intelligence. Remember Alfred Binet, who developed a set of tests to measure the intelligence of French children at the turn of the 20th century? His work provides the foundation for nearly all education systems worldwide. All those essays, reports and exams that you slaved over and were awarded marks for provided feedback on your intellectual ability. In other words, you used these school marks to compare yourself realistically with your classmates to see if you were better or worse than them. Probably more memorable were your teachers' and your parents' comments about the marks you did or did not get!

Psychometric tests, then, allow for realistic comparison between people on scores of intellectual ability and personality.

Photo 31.1 We engage in psychometric measurement at a very early age and the whole of our schooling is based on psychometric principles.

criteria to judge it. However, if they both received some form of assessment guidelines, such as a good painting should have at least six different colours, be in watercolour and be a recognisable likeness of someone, something or somewhere, then they would have a more standardised form of assessment that they could both refer to.

DEFINITION BOX 31.1

Tests

A test can be described as an objective, systematic and standardised measure of a sample of behaviour.

A test is also different from an assessment. Assessment refers to the entire process of collating information about individuals and subsequently using it to make predictions. Tests, by way of contrast, represent only one source of information within the assessment process. Spelling is one aspect of writing and so to assess it we would use a spelling test, whereas if we wanted to gauge someone's general writing ability, we would have to assess the entire process (spelling, style, grammar, punctuation etc.) (see Definition box 31.2).

DEFINITION BOX 31.2

Psychological tests

The British Psychological Society uses this definition: A psychological test is any procedure on the basis of which inferences are made concerning a person's capacity, propensity or liability to act, react, experience, or to structure or order thought or behaviour in particular ways.

Types of psychometric test

Two types of psychological test are used by personnel selection practitioners:

- tests of cognitive ability
- tests of personality measures.

Cognitive assessment tests attempt to measure an individual's ability to process information and includes general intelligence (*g*) and its various sub-components – such as spatial ability, numerical ability, problem solving and reasoning ability and verbal ability.

Personality measures are more concerned with people's dispositions to behave in certain ways in certain situations. So tests can measure, for example, characteristics such as aggression, leadership, conformity and extroversion.

Different categories of psychometric test

There are three categories of psychometric test in use by psychologists. There is a normative test, a criterion-referenced test and an idiographic test.

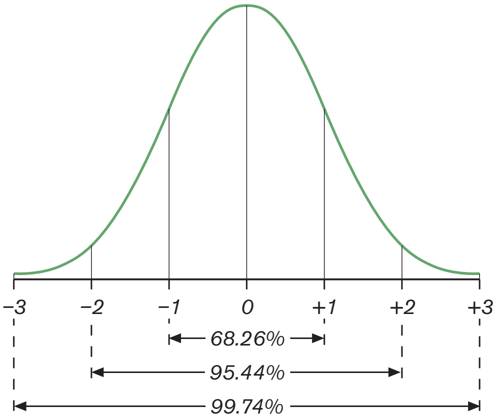


Figure 31.1 Normal distribution curve representing percentages of the population between standard deviations

TABLE 31.1 WECHSLER IQ SCORES

IQ	Archaic description	Current description	Score lower/higher than:
10	Idiot	Profound mental retardation	Fewer than 1 out of 100,000
25		Severe mental retardation	Fewer than 1 out of 100,000
40	Imbecile	Moderate mental retardation	3 out of 100,000
55	Moron	Mild mental retardation	13 out of 10,000
70		Borderline	2 out of 100
85	Dull normal	Low average	16 out of 100
100		Average	Half
115		High average	84 out of 100
125		Superior	95 out of 100
130	Genius	Very superior/gifted	98.5 out of 100
145			9,913 out of 10,000

Normative tests

Most psychometric tests in use today are normative or norm referenced – which means that data exist that tell us what range of scores is expected from the population under consideration. For example, if you are told you have a language ability score of 120, this means nothing to us on its own. We need some other vital information by which you can compare this score to a standard.

To make more sense of this score of 120 we would need to know the range (worst possible and best possible score), the mean score (average) and the standard deviation for this test. The mean score (as you will see in Section 8 on research methods) is the average score (total of items divided by the number of items). The standard deviation (as you will discover in that same section) is the most important measure of dispersion and is used to determine how far, on average, a score is from the mean.

So, if we know the mean score for people on a language ability test is 100, you now have something to compare your own score with and you could conclude that you are better than the average person on verbal ability. If we also had the standard deviation we could also work out more precisely what your score means compared to others by using the normal distribution of scores for this verbal ability test. The normal distribution for this verbal ability test is presented in Figure 31.1.

We can see from the data presented in Figure 31.1 that the mean score for the test is 100 and the standard deviation is 15. A score of 120 is between one and two standard deviations above the mean. So we could be quite precise in concluding that not only is the score above average, but that 14% of people have a very similar score as this, only about 2% score better than it, while about 84% of people have a score lower. This is the advantage of norm-based tests – they allow us to predict quite precisely where people fit in relation to others on psychometric tests. Thus most intelligence tests will be constructed to produce scores with a mean of 100.

Table 31.1 shows the labels and frequency of the Wechsler IQ scores (with the old labels that were used to describe people!).

Criterion-referenced tests

Criterion-referenced tests are used in the assessment of competencies and are commonly used in education. For example, if a child is presented with a set of reading problems one criterion for entering a particular class might be that the child will correctly solve each problem; if they fail to meet this criterion then they are assigned to a lower grade class.

Idiographic tests

Normative psychometric tests rely on the respondent being placed in some position relative to others. Sometimes this is not completely relevant. Suppose you wanted to see how psychoanalytic counselling is helping an individual overcome aggressive tendencies. We want to see if this individual has improved since attending therapy. Idiographic tests would be employed in this case to monitor individual progress under treatment. The respondent would usually be given a number of the questionnaires over a set time period to investigate his or her progress.

Self-test:

- Name the two types of psychological test and give an example where they might be used.
- What are ‘criterion-referenced’ tests?
- Where might ‘idiographic’ tests be usefully applied?

Cognitive testing

Intelligence tests are commonly used in two main areas: occupational psychology for job selection and promotion and educational psychology for academic and career assessment. According to Kanfer et al. (1995):

APPLICATIONS BOX 31.1

Applications of intelligence tests

Psychological tests are administered in a variety of settings, including schools, colleges and universities, hospitals, outpatient healthcare settings, social agencies, prisons and employment or human resources offices. They come in a variety of formats, including written, verbal and computer administered.

In terms of measuring school achievement, Jenson (1980) reports that the Wechsler verbal IQ score correlates well with achievement in elementary school. Performance on the Wechsler tests also has strong correlations with subsequent job status, with individuals scoring highly achieving jobs in science and law, and those who score low tending to have less prestigious occupations (Cronbach, 1990).

IQ tests measuring general intellectual ability (*g*) have been reported to predict success in job training (Ree and Earles, 1991), and Ackerman and Kanfer (1993) have used the assessment of spatial ability as a selection criterion for air traffic controllers.

> *Tests of intellectual abilities are the single most predictive element in employee selection. Such tests are generally more valid than the use of academic and employment credentials – and certainly more valid than the use of personnel interviews – in predicting training and on-the-job success.*

Cognitive ability tests fall into two categories in terms of administration of the test: individually administered tests occur in one-on-one situations and are given by a psychologist trained in test administration; group administered tests are taken by a number of individuals at the same time.

There are also several different types of cognitive test: speed tests, power tests and knowledge tests. These three types of test are collectively known as *maximum performance tests*, because the person taking the test is asked to perform to the best of their ability:

- Speed tests are where the person taking the test attempts to answer the questions in a set time period (so, for example, timed exams are an example of a speed test).
- Power tests are where the person attempts to complete a task in their own time and the measure of success is (1) whether they succeed or not and (2) how long they take. Swimming certificates, for example, expect individuals to swim a set distance.
- Knowledge tests are those tests that get the person taking the test to rely on their general and specific knowledge of the world around them (for example, the game of Trivial Pursuit is based on this type of cognitive test).

Tests can also be combined, so, for example, a short-answer timed examination would be a combination of a speed test and a knowledge test.

Personality testing

Personality tests are concerned with attempting to measure people's characteristics or traits. They also are more standardised and economical (in terms of both time and money) than methods such as interviewing and observation.

There are two forms of personality test employed by psychologists. These are objective tests and projective tests.

Objective personality tests

These are questions administered to individuals who are asked to rate their own actions or feelings in set situations. For example, an individual might be given the statement 'At a party I am the life and soul' and asked to choose a further statement that best applies to them in this situation. The options might be: this would always apply to me; this sometimes applies to me; this never would apply to me. Such a method is called self-report and self-report personality inventories provide a convenient way of gaining a picture/snapshot of a candidate's disposition at any one given moment in time. As we have seen in Chapter 29, personality does change over the lifespan and so in order to be more accurate a test would need to be administered several times over a longer time period (see Applications box 31.1).

Some objective personality tests focus on measuring one personality characteristic such as extroversion, while others measure a small group of related traits such as empathy and social responsibility.

Projective tests

Projective tests require individuals to formulate an unstructured response to some form of ambiguous stimuli or task. So individuals may be presented with an ambiguous picture and asked to describe what the picture represents to them. These are widely used to attempt to identify personality characteristics related to abnormal psychological functioning. The most commonly used projective instruments (Watkins et al., 1996; Wilson and Reschly, 1996) fall under one of three categories: drawings, inkblot techniques and verbal/storytelling techniques. The most commonly encountered one is the Rorschach ink-blot test (Rorschach, 1921).

Use of the Rorschach test declined in the 1960s and 1970s and it has now been overtaken by the thematic apperception test (TAT) (Bellak, 1993), which can be used for adults as well as children down to the age of 4 years (see Figure 31.2). Also widely used is the children's apperception test (CAT) (Bellak, 1993), which was designed for children aged 3 to 10 years. Where the TAT consists of sets of black-and-white pictures depicting various scenes, the CAT depicts cartoon-like pictures of animals in human

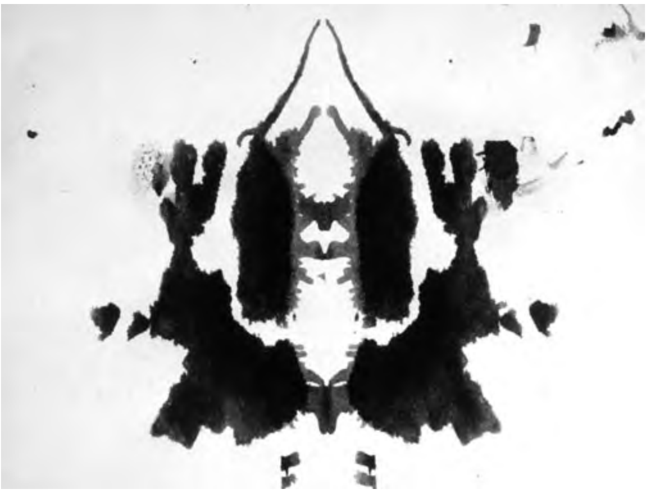


Photo 31.2 The Rorschach ink-blot test

situations that relate to various developmental themes (e.g. toilet training, feeding, sibling rivalry). The task is for the examinee to tell a story based on the picture. Projective tests are based on the assumption that, in ambiguous situations, a person will impose meaning and structure dictated by his or her own unique personality.

Objective tests are often criticised for lacking complete objectivity. The test scorer's interpretation of open-ended information is often said to be subjective and arbitrary. For example, if two people had to interpret someone's story based on a picture they had just seen, would they draw the same conclusions in what they write? If not, how do we know which one is right and which one is wrong? Because of this projective tests have been criticised for having lower validity than objective tests (see Applications box 31.2).

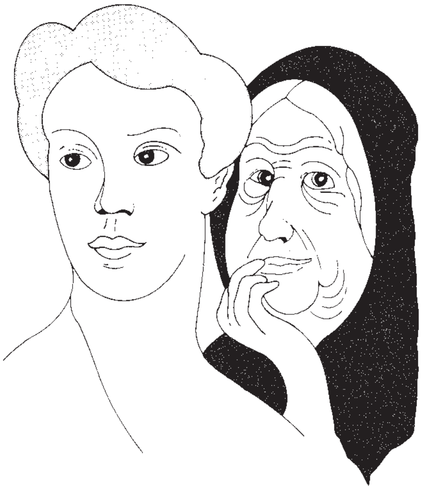


Figure 31.2 Sample TAT picture

Self-test:

- What is a power test? Give an example.
- Give an example of a projective personality test.
- Name two areas in which personality tests have been utilised.

Principles of psychometric tests

Just because a personality test or intelligence test is written on a piece of paper, this does not ensure that it is either a reliable or a valid test. Neither does it assume that the test has been standardised. These three concepts, standardisation, reliability and validity, are essential criteria for a good psychometric test.

Test standardisation

Test standardisation ensures that the conditions are as similar as possible for all individuals who are given the test. Standardisation also ensures that no matter who gives the test and scores it, the results should be the same. To enable meaningful comparisons between individuals, test makers have to first give the test to a representative sample of people. So, if everyone takes the test under the same conditions and are scored in the same way, we can make viable comparisons between them. Let's say we wanted to investigate the knowledge of chemistry of a psychology undergraduate class. We give all students the same chemistry test under the same conditions and we score them in the same way. In order for us to assess their relative chemistry knowledge we should compare their scores with other psychology undergraduates, since they are all from

APPLICATIONS BOX 31.2

Applications of personality tests

Psychological tests are administered for a variety of purposes in many applied psychological settings. For example, criminal psychologists might employ questionnaires to measure impulsivity and its relationship to crime, or they might use tests to evaluate criminal defendants in order to determine their competence to stand trial, and/or to determine sanity as it relates to criminal responsibility. Health psychologists might measure people's optimism in relation to their response to cancer diagnosis.

Occupational psychologists often employ personality tests to predict job performance and job suitability. For example, Barrick and Mount (1992) concluded that extroversion was a valid predictor of job performance for people with jobs based on social interaction, such as managers and salespeople, and Furnham (1992) has reported that workers who score highly on 'negative affect' (neuroticism, anxiety, irritability) tend to be less productive, have less job satisfaction and are more prone to absenteeism.

the same population (psychology undergraduates). It would be wrong to compare their scores with chemistry undergraduates' scores, as chemistry undergraduates study chemistry and *should* therefore be better at it! We need to compare like with like to get a more accurate estimate of people's test scores.

Both IQ and personality tests often summarise the test taker's performance in terms of scores. Scores allow the calculation of norms and norms are descriptions of the frequency of particular scores. Many psychometric tests are designed for individuals from diverse ethnic, socioeconomic and age groups. Norms tell us what percentage of a group of people obtained each possible score on an exam for example. How many of them scored 5% , 50% or 90% as a basis of their ethnicity, age and socioeconomic status. Norms have been useful in education to produce criteria for standards.

Test reliability

As you have seen elsewhere in this book, reliability refers to something that is stable and something that is repeatable. In other words, a test must measure the same thing in the same way every time someone takes it. The greater the reliability of a test, the more confident we are that the testee's scores are real and do not reflect such things as luck, being in a good/bad mood, being hungry or being too hot.

There are two types of test reliability:

- *Internal consistency reliability*. This ensures that all the parts of your test questionnaire are reliable. So, is every question throughout the test a reliable question in terms of what you are trying to measure? One method that can be used to test this is called *split half reliability*. Split half reliability is a correlational test that compares either the first half of the test with the second half or all the odd-numbered questions against the even-numbered questions. If the questionnaire has internal consistency reliability among all its questions, we should get a positive correlation (i.e. the questions are all measuring the same thing).
- *Test–retest reliability*. This ensures that your questionnaire remains valid over time. If a test is given out on two separate occasions (say, different days of the week) and different scores are achieved, one of the scores must be wrong. A reliable test would measure what it was supposed to measure at *any time* it was administered. Time should not make the test score different. To measure test–retest reliability the test should be given out on more than one occasion with a time delay. The greater the positive correlation between these two time-separated scores the more reliability the test has. It must yield consistent results over time.

TABLE 31.2 THE FOUR TYPES OF TEST VALIDITY

1. Face validity relates to the appearance of a test. Does an aggression test actually look like it is a test to measure aggression?

2. Concurrent validity predicts that if you made up your own test of 'honesty' and correlated scores on it with scores on an existing standardised test of honesty, you should get a high correlate if your test is valid. In other words, standardised psychometric tests serve as benchmarking devices for the construction of new tests.

3. Predictive validity suggests that your test should be related to future behaviour. So if someone scores high in social anxiety on your test then we should see that person getting anxious in social situations in their future behaviour. If they do not, then your test is invalid as it does not relate to actual behaviour. Sternberg *et al*. (2001) suggest that tests where the results are carefully interpreted, after extensive training, offer the best predictive validity for future behaviour.

4. Construct validity suggests that if all our hypotheses about the test variable (construct) are supported, we have a high degree of construct validity. For example, with an anxiety test we might test the following hypotheses:
   - high scorers would be more likely to be receiving psychiatric/psychological support than low scorers
   - high scorers would be less likely to be in stressful or dangerous occupations
   - the anxiety test will have positive correlations with other anxiety tests
   - the anxiety test will not correlate with personality tests not measuring anxiety
   - the anxiety tests should have zero correlation with tests that measure ability and motivation.

   The more of these hypotheses that we find to be true, the greater the construct validity of the test.

Test validity

A test might have high reliability but still possess low validity. Let's suppose you wanted to find a new person to fill a vacant job position in your firm of lawyers. The test you decided to administer was whether they could touch their nose with their tongue. The fact of this is that if you can touch your nose with your tongue you can and if you can't you can't! That is, it is a reliable test – the same results would be obtained over a time period with the same challenge. However, your test lacks any validity – what on earth does being able to touch your nose with your tongue tell you about whether that person will make a good lawyer or not? Aiken (1997) suggests that the validity of a test reflects the degree to which it measures what it sets out to measure.

There are four types of test validity, which are presented in Table 31.2. (See Applications box 31.3 for example intelligence tests.)

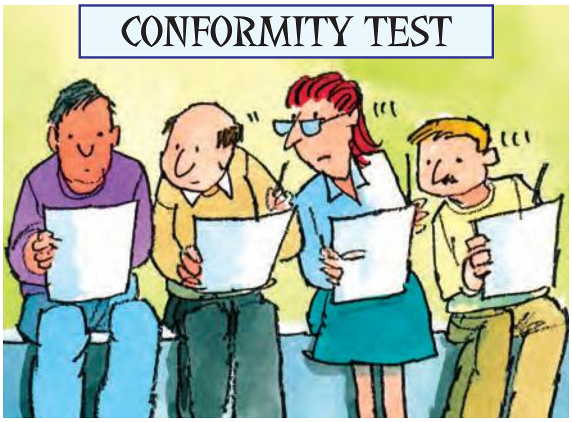
Self-test:

- What is test–retest viability?
- What is concurrent validity?
- What is predictive validity?

Problems with psychometric tests

There are several potential problems associated with psychometric testing. These are generally divided into two types of problem: (1) those that derive from how the respondent goes about completing the test and (2) those that derive from the nature of the test contents themselves.

Social desirability and acquiescence



When faced with a psychometric test many people feel they are being judged. For example, if a test is measuring hostility, then the person might assume that hostility is a negative behaviour and amend his or her answers accordingly so that they will be seen in a more positive light. This phenomenon is called social desirability (also known as acquiescence) and is a way of faking your responses.

So people try to answer the questions on the test in a way that they feel presents them in a more socially desirable way. This problem tends to be associated more with personality tests than intelligence tests. We would all like to do better on intelligence tests but if we do not know the answer we can't easily fake greater intelligence! With personality tests we can at least make a judgement regarding what might be a more acceptable way of presenting ourselves.

People might engage in social desirability for two reasons:

1 *Self-deception*. Here individuals are overly optimistic in their perceptions of their own positive personality features and play down their perceived negative

APPLICATIONS BOX 31.3

Example intelligence tests

The *Wechsler intelligence* scales are the most popular among intelligence tests (Watkins et al., 1996; Wilson and Reschly, 1996). There are three different Wechsler intelligence tests that are structurally similar but differ with regard to the target age range.

The Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R) (Wechsler, 1989) is the most recent version of the test normed for ages 3 to 7.3 years; the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) (Wechsler, 1991) is normed for ages 6 to 16 years, 11 months; and the Wechsler Adult Intelligence Scale-Third Edition (WAIS-III) (Wechsler, 1997) is normed for ages 16 to 74 years. All three are well normed with considerable data supporting their reliability and validity.

The fourth edition of the *Stanford–Binet* test (SB-IV) (Thorndike et al., 1986) represents several advances over previous versions of this first of all intelligence tests. Like the Wechsler tests, the SB-IV is an individually administered test that requires extensive training to administer. It is well normed for ages two through to adulthood, thus allowing assessment of younger children than does the WPPSI-R.

The SB-IV is composed of 15 tests divided into four cognitive areas: verbal reasoning, abstract/visual reasoning, quantitative reasoning and short-term memory. Its reliability coefficients are excellent, and validity data indicate high correlations with other intelligence tests, with older versions of the Stanford–Binet test, and with measures of academic achievement (Thorndike et al., 1986; Laurent et al., 1992).

aspects. Furnham et al. (2002) have shown that both males and females tend to rate their father's IQ scores as higher than their mother's, their brothers' scores higher than their sisters' and their sons' scores higher than their daughters' regardless of the reality of the relative intelligences!

2 *Impression management*. Individuals try to appear 'nice' because they fear social disapproval and reprimand for negative behaviour.

Mood and environmental influence

Another set of factors that might influence psychometric performance are those associated with mood and environmental conditions. On personality tests people in a good mood might answer the questionnaire completely differently than if they were in a bad mood. Features of the environment, such as noise, heat and light, might also have an impact on our moods and also on our cognitive abilities as well. Hancock (1986) has demonstrated that high temperature has a significant negative effect on vigilance, attention, memory and reaction time – all important elements of intelligence-based tests.

Ecological validity

Ecological validity is the extent to which research findings and methods can be generalised to common behaviours and natural settings. Research that lacks ecological validity focuses on what an individual can do in a research environment instead of what they are usually doing in their everyday lives. For example, IQ tests that ask general knowledge questions about areas that are not important to individuals' daily lives will lack ecological validity. It has been shown, for example, that, in general, many people perform badly when dealing with calculating fractions on IQ tests. This is probably due to the fact that in many people's daily lives being able to calculate fractions has not bearing on their existence. However, people who attend slimming clubs, who have to calculate calorie intake and use fractions on a daily basis, are much better at IQ-based fraction-type questions. So, in other words, if a test is not relevant to an individual's lifestyle, an individual probably will not perform well at it. This might be due to a lack of motivation or experience with the type of problem set than any lack of intellectual capability.

Cultural bias

One area of rightful contention in the field of psychometric testing is the possibility of bias in such tests against members of ethnic subgroups of the population (see Activity box 31.2).

Standardised tests are widely criticised as culturally inappropriate for many groups, both in content and in process. This criticism usually centres on the differing relevance of the content to people from different cultures. For example, newly arrived immigrants can be expected to have greater difficulty with an intelligence test asking them to name past leaders of the country to which they have recently immigrated. Tests that are based on English discriminate against the language ability of minority groups whose mother tongue is not English. Furthermore, translation into native languages does not always help because many words or phrases may not have direct translations.

Panayiotou et al. (2004), using a sample of 1204 individuals, evaluated the psychometric properties and factor structure of the Greek five-factor inventory (NEO-FFI). Exploratory factor analyses failed to reproduce the appropriate factor structure, yielding instead numerous fragments of the five dimensions. Confirmatory factor analyses also failed to lend support to the five-factor model of personality as measured by this instrument. Based on these results, the authors suggested that use of the instrument is recommended only with serious caution in this cultural context. In other words, this psychometric personality test that is widely used in the west didn't seem that applicable to a Greek population (see Class activity box 31.1).

Attempts have been made to develop culture-free and culture-fair (culture-neutral) tests of intelligence, but, on the whole, these attempts have not been successful. Conceptions of intelligence vary widely from culture to culture (in the west speedy answers are linked to intelligent behaviour, whereas in parts of Africa you are considered intelligent if you take your time and give a considered answer) and abstracting the few common elements, or what appear to be the few common elements, cannot be depended on to produce a reliable guide to intelligence. Furthermore, even if the content of a test can be made culture free or fair to all cultures, culture will still affect the results through attitudes towards tests, test taking, competition and so on.

ACTIVITY BOX 31.2

Problem-solving around the world

Consider the following. Ivan always eats his breakfast with Boris. Boris is presently eating his breakfast. What is Ivan doing?

Most of us would probably answer that Ivan too was eating his breakfast, as this seems logical from the information we have been given. However, in some cultures such a question would yield a completely different answer. In some cultures the answer would more probably be that they do not know what Ivan was doing as they have never met him and so could not possibly comment on his behaviour!

This might sound strange to those brought up in the west, but it is a totally logical answer. In other words, we should not assume that people around the world use the same problem-solving parameters.

For example, white and Asian Americans achieving higher scores than black Americans on many IQ tests developed in America. However, a test developed by Professor Robert L. Williams to reflect black American lifestyles and cultural values, the black intelligence test of cultural homogeneity (BITCH), gives higher overall scores in general to black Americans than white/Asian Americans. This generally highlights that most tests are not culture free and as a result bias exists in many tests against certain sub-groups of the population.

There is no simple solution to this problem of culture bias. No one has as yet been successful in devising an intelligence test that does not produce discrepancies in scores between sub-groups.

Some researchers have tried to address cultural bias. The Leiter International Performance Scale-Revised (Roid and Miller, 1997) is an untimed test, which is normed for ages 2 to 20 years and is administered using essentially no verbal instructions. Each set of items begins with a simple example which is prompted through pantomime. This revised version covers four domains of functioning: reasoning, visualisation, attention, and memory. Unlike its predecessor, the revised Leiter generates standard scores rather than the cruder ratio IQ scores.

Another test that is relatively free of cultural biases is Raven's progressive matrices (Court and Raven, 1995). This test comes in three forms, two of which are appropriate for use with children: the coloured progressive matrices (normed for ages 5½ to 11½ years) and the standard progressive matrices (normed for ages 6 to 80 years). Raven's matrices are administered in a multiple-choice format. The test begins with simple visual discrimination and gradually moves to more difficult perceptual analogies and reasoning problems. Raven's matrices are untimed and can be administered using virtually no language.

Self-test:

- Give an example of social desirability in relation to psychometric testing.
- What is impression management and how might it affect filling in a questionnaire?
- Give an example of how the environment might affect someone taking a psychometric test.
- Give an example of cultural bias in terms of psychometric testing.

Summary

The term 'psychometrics', then, refers to tests measuring both personality and intellectual functioning. The principles of psychometric testing include standardising and ensuring validity and reliability of the content of tests. Tests have been applied in many areas of psychology such as health,

CLASS ACTIVITY BOX 31.1

All in the same boat?

Consider the following problem. A farmer wishes to take a fox, a chicken and a bag of grain from one side of a river to the other. He has space in his boat for himself and one more thing. He cannot leave the chicken alone with the grain, otherwise it will eat it, and he cannot leave the fox alone with the chicken as the fox will eat the chicken. Can you work out how many trips he will need to make to get them all safely to the other side of the river?

The solution is below. Did you get it right? If we presented this abstract problem in other parts of the world we might get some of the following responses.

- How does the farmer help me if I help him?
- I don't know the farmer so I won't interfere.
- What on earth is a farmer doing with a fox in the first place?!

None of these responses is unintelligent – they are all based on logic. So it is important to be aware that most standardised psychometric tests are based on western definitions and western cultural practices.

Solution: the farmer would need to make four trips. He first takes the chicken to the far bank. He then comes back for the grain, takes it across to the far bank and then takes the chicken back with him again to where he started. He leaves the chicken at the near bank and collects the fox. He drops the fox off with the grain on the far bank and comes back one final time for the chicken.

criminal and occupational psychology. Tests are not yet culture free, neither are there tests that seem to be applicable for all people in all situations. We need to recognise that many tests are, at best, only a reflection of a particular academic's theory about the nature or personality or intelligence. These theories are still evolving as our psychometric tests (Jackson, 1996).

Learning outcomes

When you have completed this chapter, you should be able to:

1 Describe the main types of psychometric test.
2 Understand the difference between intelligence and personality testing.
3 Describe the main principles of psychometric tests.
4 Understand problems associated with psychometric tests such as ecological validity and cultural bias.
5 Give examples of how psychometric testing has been used within the field of psychology.

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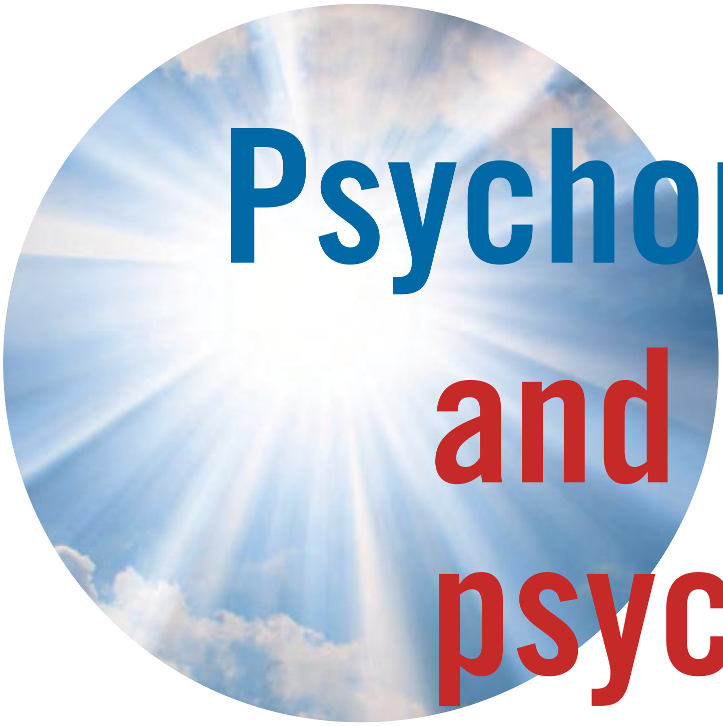
sectionseven

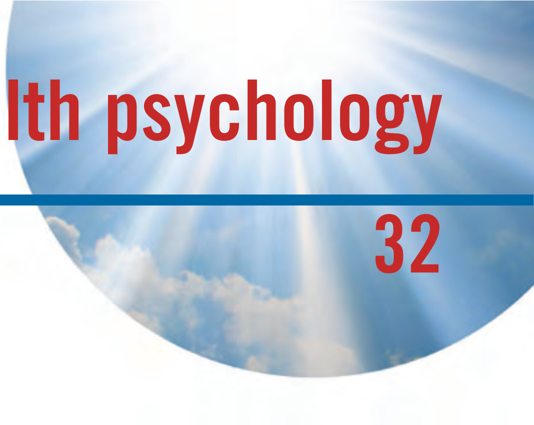
Graham Davey



Psychopathology and health psychology

32 Basic issues in psychopathology 465
33 Psychopathology and its causes 478
34 Treating psychopathology 508
35 Health psychology 526

Psychopathology and health psychology



32

Basic issues in psychopathology

Route map of the chapter

This chapter provides a necessary introduction to psychopathology and clinical psychology, and is concerned with how we identify, define and classify psychopathology and psychological disorders. The chapter is divided into three main sections covering the concept of madness (i.e. how we try to explain mental illness), definitions of abnormality, and the classification of psychological disorders. Finally, the chapter briefly discusses what it means to have good psychological health.

Introduction

How regularly do you use the terms ‘madness’ and ‘insanity’? Probably quite often in relation to your own behaviour (e.g. ‘I must have been mad to pay money to watch England play cricket!’), and just as frequently to describe the behaviour of others (e.g. ‘Anyone who wants to be a contestant in *Big Brother* must be mad!’). We tend to use terms like madness and insanity in a number of circumstances – for example, (1) when someone’s behaviour deviates from the expected norm, (2) when we are not sure of the reasons why someone is doing something, (3) when a behaviour seems to all intents and purposes to be irrational, or (4) when a behaviour appears to us to be maladaptive or potentially harmful. This discussion of the terms ‘madness’ and ‘insanity’ leads us on to those areas of thinking and behaving which seem to deviate from normal modes of functioning. For psychologists, the study of these deviations from normal or everyday functioning are labelled psychopathology, and the branch of psychology responsible for understanding and treating psychopathology is known generally as clinical psychology.

However, deciding what are proper and appropriate examples of psychopathology is not easy. As we shall see, just because someone’s behaviour deviates from accepted norms and patterns of behaviour does not mean that they are suffering from a mental or psychiatric illness. Nor are we able to define psychopathology simply on the basis that some ‘normal’ functioning (psychological, neurological or biological) has gone wrong. This is because we are still far from understanding the processes that contribute to many psychological disorders – so we don’t yet know whether some disorders are caused by the disruption of normal functioning. So, before we discuss some of the psychological disorders that we do know something about (Chapter 33), it is important to discuss how we define and classify psychopathology.

Models of psychopathology

Throughout history we have always been willing to label some people as ‘mad’ or ‘insane’, usually on the basis that their behaviour is unpredictable, irrational, harmful, or simply that it deviates from accepted contemporary social norms. Examples include the Roman Emperor Caligula, King George III, Vincent Van Gogh, King Saul of Israel, Virginia Woolf, to name just a few. However, while we have always been willing to label some individuals as ‘mad’, we have not always understood what causes them to behave in the way they do, and it is how we attribute the causes of mental illness that can determine how we conceptualise madness.

Demonic possession

When individuals display signs of mental illness or psychological disorder, the first thing that is usually noticed is a change in the individual’s personality. The reserved person may become manic and outgoing, the gregarious person withdrawn and sombre. They may even start behaving in ways which are distinctly out of character, and which may be harmful to themselves and to others. The fact that an individual’s personality seems to have changed (and may do so very suddenly) has historically tended people towards describing those with psychological problems as being ‘possessed’ in some way (i.e. their personality has been taken over and replaced by the persona of someone or something else).

Explanation in terms of ‘possession’ has taken many forms over the years. It has sadly ensured that many who have been suffering debilitating and distressing psychological disorders have been both persecuted and physically abused rather than offered the support and treatment they need. In Ancient Egyptian, Chinese, Babylonian and Greek civilisations, individuals suffering symptoms of psychopathology were regularly believed to be possessed by bad spirits (this is known as demonology), and the only way to exorcise these bad spirits was, at best, with elaborate ritual ceremonies, or more likely, with direct attacks on the victims body to force the demons out (e.g. through torture, flogging, starvation). Not surprisingly, such actions usually had the effect of driving the sufferer even deeper into their malaise.

Demonology survived as an explanation of psychopathology right up until a couple of centuries ago, and was prominent in the 17th and 18th centuries when witchcraft and demonic possession were common explanations for psychopathology. This contrasts with the Middle Ages in England, when, by comparison, individuals with mental health problems were treated in a relatively civilised fashion. From the beginning of the 13th century lunacy trials were held to determine an individual's sanity, and if a person was found to be insane, they were given the protection of the law (Neugebauer, 1979).

Nevertheless, demonic possession is still a common explanation of psychopathology in some less developed areas of the world – especially where witchcraft and voodoo are still important features of the local culture (e.g. Haiti, and some areas of Western Africa) (Desrosiers and Fleurose, 2002).

The medical or disease model

As we began to understand some of the biological causes of physical diseases, then so our conception of 'madness' moved very slowly towards treating it as a disease (hence the term 'mental illness'). The impetus for this came in the 19th century, when it became apparent that many forms of behaviour that we would label as 'mad' were the result of physical illnesses, such as strokes or viral infections. For example, without proper treatment, the late stages of the sexually transmitted disease, syphilis, are characterised by the inability to coordinate muscle movements, paralysis, numbness, gradual blindness and dementia – and many of these symptoms caused radical personality changes in the individual labelled at the time as 'madness'. When it was discovered that syphilis had a biological cause, and that it was also one of the main contributors to the mental disorder known as general paresis, it became clear that many other examples of mental illness might also have medical or biological explanations. This became known as the somatogenic hypothesis, which advocated that the explanation of psychopathology could be found in physical or biological impairments.

The medical model of mental illness was an important development because it moved psychopathology out of the dark ages when explanation was dominated by superstitious and religious beliefs, and into an era when sufferers could begin to be treated rather than punished for their ailments. The medical model has given rise to a large body of scientific knowledge based on medicine (known today as psychiatry), which attempts to identify the biological causes of psychopathology, and attempts to treat such problems with medication or surgery. In Chapter 33, you will notice that many mental health problems have putative explanations which are biological in nature, and range from explanations in terms of genetic inheritance (e.g. schizophrenia, bipolar disorder), brain dysfunction and brain injury (e.g. OCD), imbalance in brain and body

FOCUS POINT 32.1

Can perfectly normal processes cause bizarre behaviour?

A revealing study by Ayllon, Haughton and Hughes in 1965 provides insight into some of the processes that might generate the kinds of bizarre and apparently irrational behaviour that make up some forms of psychopathology.

They used operant reinforcement methods (see Chapter 8) to reward a female patient diagnosed with schizophrenia for carrying a broom.

Whenever she was observed holding the broom a nurse would approach her, offer her a cigarette, or give her a token which could be exchanged for a cigarette. After a period of this reinforcement, the patient was carrying the broom around for most of the day, and even taking it to bed with her when she slept.

At this point, the researchers called in two psychiatrists (who were unaware of the reinforcement schedule) to give their opinions on the nature of the behaviour. One of them gave the following reply:

'Her constant and compulsive pacing, holding a broom in the manner she does, could be seen as a ritualistic procedure, a magical action . . . Her broom would be then: (1) a child that gives her love and she gives him in return her devotion, (2) a phallic symbol, (3) the scepter of an omnipotent queen . . . this is a magical procedure in which the patient carries out her wishes, expressed in a way that is far beyond our solid, rational and conventional way of thinking and acting' (Ayllon *et al*., 1965, p3).

First, this psychodynamic explanation given by one of the psychiatrists is a good example of how easy it is to over-speculate about the causes and meaning of a behaviour when the real causes are unknown.

Second, it shows how behaviour that is viewed as representative of psychopathology can be acquired through a perfectly normal learning mechanism (in this case operant reinforcement).

biochemistry (e.g. schizophrenia), and the physical effects of pathological activities (such as the hyperventilation theory of panic disorder).

However, despite its obvious importance in developing some influential treatments, the medical model of psychopathology has some important implications for the way that we conceive of mental health problems. First, an obvious implication of the model is that it implies that medical or biological causes underlie psychopathology – and, while this may be true in some cases (e.g. some forms of schizophrenia), it is not so obviously true in many others. For example, maladaptive behaviour labelled as disordered can often be the result of perfectly normal and intact psychological processes, and Focus point 32.1 gives an example of how apparently bizarre behaviour in a schizophrenia sufferer can be produced through a normal learning process. Indeed, both psychodynamic and contemporary cognitive accounts of psychopathology argue that many psychological problems are the result of normal psychological processes, and it is the *experiences* that an individual has that may cause a disorder – not their biology or biochemistry.

Second, the medical model adopts what is basically a ‘reductionist’ approach (see Chapter 5) by attempting to reduce the complex psychological and emotional features of psychopathology to simple biology. It is arguable whether the phenomenology (i.e. the personal experience of psychopathology) or the complex cognitive factors involved in many psychological disorders can be reduced to biology. Indeed, when we take a look at the different forms of psychopathology described in Chapter 33, it is very hard to believe that many of the dysfunctional beliefs that maintain anxiety and mood disorders, and the personality factors that constitute vulnerability to disorders such as PTSD, GAD and depression, can be reduced to simple biology.

Third, there is an implicit assumption in the medical model that psychopathology is caused by ‘things not working properly’. That is, either your biochemistry is imbalanced, or, for example, disorders result from deficits in brain or central nervous system functioning. This ‘something is broken and needs to be fixed’ view of psychopathology is problematic for a couple of reasons. (1) It is becoming clear that not all psychopathology is the result of a deficit or dysfunction in either biological or psychological mechanisms – instead psychopathology may merely represent a more extreme form of normal behaviour (Davey, 2003). For example, everyone worries – but for some of us it becomes such a prevalent and regular activity that it becomes disabling. When worry becomes chronic in this way, it may well lead to a diagnosis of generalised anxiety disorder (GAD) (see Chapter 33, page 483). However, there is no reason to suppose that the mechanisms that generate the occasional worrying bout in each of us are not the same ones that generate chronic worrying in others. (2) Implying that psychopathology is caused by a normal process that is broken, imperfect or dysfunctional has implications for how we view people suffering from psychological disorders (and how they view

FOCUS POINT 32.3

A question of dignity

Written by Louise from her own experience with depression

‘During an episode of depression accompanied by anxiety, I shared my illness with a large number of people. In retrospect, now that the depression is lifting, I realise that this was a grave mistake, at least in light of the way society functions . . . What has occurred?

When I was deeply depressed, I noticed that some friends departed. I understand now that they could not cope with depression and withdrew. In a few cases the rejection was rude and cruel and those who had seemed to be friends were found not to be so. Other friends stayed and offered their help.

In some cases I became a ‘second-class citizen’. I could be treated with a briskness and dismissive air that had never been present before. I could be rudely dismissed and ignored on special occasions. My presence was clearly thought to be potentially threatening. Perhaps I wouldn’t be happy enough or would introduce inappropriate topics. I had laid bare my weakness and others were not about to forget it. These people, like all human beings, probably thought that they were doing the right thing. They were saving others from my presence. They also probably thought that they were treating me as my merits deserved. I had permanently lost the respect and consideration that I had once received.

It is no wonder that people conceal serious illness, whether cancer, heart disease, or mental illness. Once exposed, these illnesses prove to be unforgettable to others. People never walk with the same dignity again. To some this weakness justifies treatment that shows no respect to the person as a human being. Somehow the person is seen to be responsible for the weakness and therefore appropriately blamed. The person has lost the right to be treated with honour. This honour is accorded only to those who are strong, healthy, and successful.’

Source: http://www.mentalhealth.com/story/p52-dp11.html themselves). At the very least, it can be stigmatising to be labelled as someone who is biologically or psychologically imperfect, it can even encourage individuals to adopt a long-term 'role' as an individual with what they perceive as a debilitating illness (Scheff, 1975), and we often view individuals with psychological problems as second-class citizens – even when their symptoms are really only more prominent and persistent versions of the characteristics that we exhibit ourselves (i.e. we all have bouts of anxiety and depression, we all worry, we will all display obsessive or compulsive tendencies, and we will all behave bizarrely enough at one time or another to be called 'mad'!). Focus point 32.2 shows how different people's reactions can be to someone with a psychological disorder, and how this can often lead to loss of respect and consideration when they perceive that individual as no longer being a properly functioning member of society.

Furthermore, studies have suggested that stigmatising attitudes towards people with mental health problems are widespread and commonly held (Crisp et al., 2000). In a survey of over 1700 adults in the UK, Crisp et al. (2000) found that (1) the most commonly held belief was that people with mental health problems were dangerous – especially those with schizophrenia, alcoholism and drug dependence, (2) people believed that some mental health problems such as eating disorders and substance abuse were self inflicted, and (3) respondents believed that people with mental health problems were generally hard to talk to. People tended to hold these negative beliefs regardless of their age, regardless of what knowledge they had of mental health problems, and regardless of whether they knew someone who had a mental health problem. The fact that such negative attitudes appear to be so entrenched suggests that campaigns to change these beliefs will have to be multifaceted, will have to do more than just impart knowledge about mental health problems, and will need to challenge existing negative stereotypes especially as they are portrayed in the general media (Pinfold et al., 2003). Class activity box 32.1 provides you and members of your learning group with an opportunity to assess your

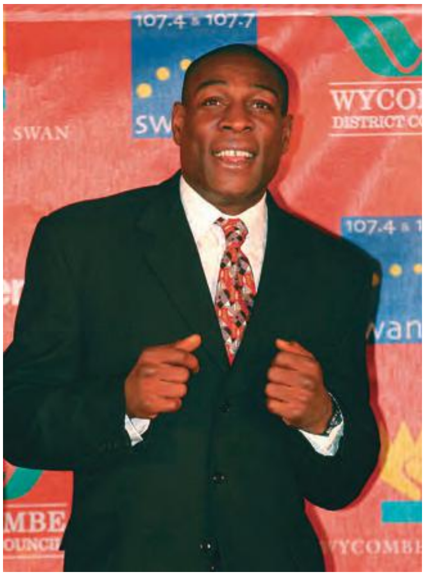


Photo 32.1 The popular press can often present mental illness in a way which propagates the stigmas attached to mental illness. In September 2003, the ex-heavyweight champion boxer Frank Bruno was treated for depression at a psychiatric hospital, and the mental health charity Sane (www.sane.org.uk) subsequently criticised unsympathetic coverage of his illness in the media.

The BBC News website reported that an early edition of the Sun newspaper had the front page headline 'Bonkers Bruno Locked Up', which was later changed to 'Sad Bruno in Mental Home'.

Sane chief executive Marjorie Wallace said: 'It is both an insult to Mr Bruno and damaging to many thousands of people who endure mental illness to label him as "bonkers" or "a nutter'"and having to be "put in a mental home".'

CLASS ACTIVITY 32.1

A mental health awareness quiz

See how many of the following questions you can answer correctly to test your awareness of mental health issues.

1. Are mental health problems inherited?
2. Violence towards others is a symptom of which mental illness?
3. 35–50 year olds show the highest incidence of suicide –True or False?
4. People who talk about suicide are not likely to go on to do it – True or False?
5. Men are more likely than women to attempt suicide – True or False?
6. What proportion of people are known to experience mental health problems? Is it (a) 1 in 8, (b) 1 in 4 or (c) 1 in 6?
7. What percentage of GP consultations are for mental health problems? Is it (a) 30%, (b) 50% or (c) 25%?
8. Drugs such as cannabis and ecstasy can increase the risk of panic attacks, anxiety disorders and psychotic episodes – True or False?
9. At what age are mental health problems most likely to occur?
10. In a Mind survey of people who currently have or have previously experienced a mental health problem,
    (a) What percentage of these people said that they had been abused or harassed in public?
    (b) What percentage of these people claim to have been harassed, intimidated or teased at work because of a psychiatric history?
11. Mental Health Media (a campaigning organisation) has identified three major stereotypes of how people with a mental illness are portrayed by the media. One of these is sad and pitiable. What are the other two?

answers at the end of the section

awareness about mental health by seeing how well you can answer the 12 questions posed in this mental health awareness quiz.

Psychological models

Moving away from the medical illness model of psychopathology, some approaches still see psychological problems as symptoms produced by an underlying cause (what is known as the pathology model), but that the cause is a psychological rather than biological one. These types of approaches often view the cause as a perfectly normal and adaptive reaction to difficult or stressful life experiences (e.g. psychoanalysis sees psychopathological symptoms as the consequence of perfectly normal psychodynamic processes which are attempting to deal with conflict). As such, many of these psychological models view symptoms as normal reactions mediated by intact psychological or cognitive mechanisms – and not as the result of processes which are 'broken' or malfunctioning.

The psychoanalytic model

This method of understanding psychological disorder originated with Sigmund Freud, and views psychopathology as unconscious conflicts being dealt with by various psychological mechanisms designed to defend against anxiety and depression. This psychoanalytic model argues that the origins of adult anxiety and depression frequently stem from childhood conflicts. While psychoanalysis is still practised, it is no longer the therapy of choice for most psychological disorders, nor is it a paradigm in which most current researchers attempt to understand psychopathology.

The learning model

This method of understanding psychological disorder derives from the behaviourist approach to psychology (see Chapter 2) and argues that many forms of psychopathology are the result of maladaptive learning. That is, individuals have encountered unusual combinations of experiences which have caused them to learn unusual patterns of behaviour. For example, this approach would argue that individuals with specific anxieties (e.g. phobias) have learnt those anxieties because of experiences (usually frightening or traumatic) that they have had in their past. People can also learn maladaptive behaviour patterns through normal learning processes as well, and Focus point 32.1 provides a

TABLE 32.1 **WHAT'S THE DIFFERENCE BETWEEN A PSYCHOLOGIST AND A PSYCHIATRIST? MENTAL HEALTH PRACTITIONERS IN THE UK**

CHARTERED CLINICAL PSYCHOLOGIST	Anyone who has been awarded a degree in psychology (most in the UK are accredited by the *British Psychological Society)* can call himself or herself a Psychologist. However, there are many different types of psychologists, and those that are qualified to offer therapy and undertake clinical assessments have undertaken an extra 3 years of specialised training. The UK Government is intending to introduce statutory regulation of psychologists in 2008, when the term 'clinical psychologist' would become a protected title that can be used only by those with accredited training.
PSYCHIATRIST	These are medically trained doctors who have undergone the normal medical training, but have chosen to specialise in mental illness. Their approach to mental illness is primarily medical, but some do offer some forms of psychotherapy. They are the only practitioner group qualified to prescribe medication.
PSYCHOTHERAPIST	Psychotherapy is an umbrella term that covers almost all forms of therapy, but psychotherapists tend to specialise in only one type of therapy (e.g. psychodynamic, humanistic). Psychotherapists do not necessarily have a basic training in psychology. Many other professionals may also have training in psychotherapy, including clinical psychologists, psychiatrists, nurses, and social workers.
COUNSELLOR	These are individuals who have been trained specifically in counselling skills, and may be skilled in the use of one or more forms of psychotherapy.
SOCIAL WORKER	These are fully trained social workers who have received further training which enables them to undertake certain forms of psychotherapy.
OTHER MENTAL HEALTH PROFESSIONALS	Under the UK Mental Health Act, many other professionals have a role to play in providing mental health services and care. They include mental health nurses, community psychiatric nurses, approved social workers, occupational therapists and community support workers.

striking example of this. The learning model approach is exemplified in contemporary behaviour analysis (see Chapter 34), which applies learning procedures such as classical and operant conditioning to treating symptoms caused by maladaptive learning.

The cognitive model

Perhaps the most widely adopted current psychological model of disorders is the cognitive model. Primarily, this approach considers psychopathology to be the result of individuals acquiring irrational beliefs and dysfunctional 'ways of thinking'. It also argues that individuals (especially those with anxious or depressive disorders) may have acquired biases in the way that they process information (e.g. attend to stimuli, or retrieve information from memory), and that these biases may cause or maintain the disorder (Williams et al., 1997). This approach has had some success in explaining many anxious and mood-based disorders, and has given rise to an influential set of treatments called 'cognitive behaviour therapy' (CBT) (Wells, 1997). The assumption here is that, if psychological disorders are caused by faulty beliefs and faulty ways of thinking, then successful therapies can be constructed by challenging and changing these faulty cognitions.

Self-test:

- Why was demonic possession such a popular way of explaining psychopathology in historical times?
- What are the pros and cons of the medical model of psychopathology?
- Describe the basic concepts underlying psychoanalytic and psychodynamic approaches to psychopathology?
- What are the learning principles on which the behavioural approach to psychopathology is based?
- Who were the main founders of the cognitive approach to psychopathology, and what were their main contributions?
- How do humanistic–existential approaches to psychopathology differ from most of the others?

Defining psychopathology

The models of psychopathology we have discussed in the previous sections are different ways of trying to *explain* psychological disorders, but they do not necessarily help us to *define* exactly what kinds of symptoms or behaviours should be considered as examples of psychopathology. For example, are all murderers mentally ill? Are the violent and antisocial tactics adopted by most terrorists indicative of mental illness? Is someone who decides to see if they can walk alone across the Arctic suffering a psychological disorder? In each of these cases, the behaviours are unusual ones which most people would never contemplate indulging in – but does that make them examples of psychopathology? Below we explore some of the possible definitions of 'abnormal' behaviour that may contribute to us defining psychopathology.

Deviation from the statistical norm

An activity or a psychological attribute might be classified as abnormal if it deviates substantially from the statistical norm (see Chapter 38). In some areas of clinical psychology this can be used as a defining feature of psychopathology For instance, in the area of learning and intellectual disabilities, if an IQ is significantly below the norm of 100 (usually 70 or less) it is considered indicative of learning difficulties requiring remedial help and attention. However, there are at least two important problems with using deviations from statistical norms as indications of psychopathology. First, in the learning disability case, an IQ of less than 70 may be statistically rare, but rather than simply forcing the individual into a diagnostic category, a better approach would be to evaluate the specific needs of individuals with learning disabilities in a way that allows us to suggest strategies, services and supports that will optimise individual functioning. Second, substantial deviation from the norm does not necessarily imply psychopathology because individuals with exceptionally high IQs are also statistically rare – yet we would not necessarily be willing to consider this group of individuals as candidates for psychological intervention.

Deviation from social norms

On an everyday basis we tend to label a behaviour or activity as indicative of psychopathology if it is far removed from what we consider to be the social norms for our culture. We assume (perhaps wrongly) that socially normal and acceptable behaviours have evolved to represent adaptive ways of behaving, and that anyone who deviates from these norms is behaving in a maladaptive or pathological way. However, it is very difficult to use deviation from social norms as a way of defining psychopathology – for a number of important reasons.

First, different cultures often differ significantly in what they consider to be socially normal and acceptable. For example, in the Soviet Union during the 1970s and 1980s, political dissidents who were active against the communist regime were regularly diagnosed with schizophrenia and incarcerated in psychiatric hospitals. This does not appear to have been purely a cynical method of political repression, but among many represented a genuine belief that anti-Soviet activity was a manifestation of mental illness (why – they claim – would anyone want to demonstrate against the perfect social system?!). Soviet psychiatrists even added to the official symptoms of schizophrenia by including '*reformist delusions*: a belief that an improvement in social conditions can be achieved only through the revision of people's attitudes, in accordance with the individual's own ideas for the transformation of reality', and '*litigation mania:* a conviction, which does not have any basis in fact, that the individual's own rights as a human being are being violated and flouted' (Ben Goldacre, *Guardian*, 16 July 2002). Since the collapse of the Soviet system, few would suspect that

FOCUS POINT 32.3

Psychopathology and culture

Psychopathology can manifest itself in different forms in different cultures, and this can lead to some disorders that are culture-specific (i.e. have a set of symptoms which are found only in that particular culture). Two such examples are *ataque de nervos*, which is an anxiety-based disorder found almost exclusively among Latinos from the Caribbean (Salman et al., 1998), and *Seizisman,* a state of psychological paralysis found in the Haitian community (Nicolas, DeSilva, Grey and Gonzalez-Eastep, 2006).

Ataque de nervos

Its literal translation is 'attack of nerves', and symptoms include trembling, attacks of crying, screaming uncontrollably, and becoming verbally or physically aggressive. In some cases, these primary symptoms are accompanied by fainting bouts, dissociative experiences and suicide attempts.

Research on *ataque de nervos* has begun to show that it is found predominantly in women, those over 45 years of age, and from low socioeconomic backgrounds and disrupted marriages (Guarnaccia et al., 1989). The symptoms appear to resemble many of those found in panic disorder, but with a co-existing affective disorder characterised by emotional lability and anger (Salman *et al.*, 1998).

From this research, it appears that *ataque de nervos* may be a form of panic disorder brought on by stressful life events (such as economic or marital difficulties), but whose expression is determined by the social and cultural norms within that cultural group. In particular, Latino cultures place less emphasis on self-control and emotional restraint than other western cultures, and so the distress of panic disorder in Latinos tends to be externalised in the form of screaming, uncontrolled behaviour and aggression. In contrast, in western cultures the distress of panic disorder is usually coped with by adopting avoidance and withdrawal strategies – hence the common diagnosis of panic disorder with agoraphobia.

Seizisman

The name literally means 'seized-up-ness' and refers to a state of paralysis usually brought on by rage, anger, or sadness, and in rare cases happiness. Events that can cause Seizisman include a traumatic event (such as receiving bad news), a family crisis, and verbal insults from others. Individuals affected by the syndrome become completely dysfunctional, disorganised and confused, and unresponsive to their surroundings (Laguerre, 1981). The following quote illustrates how viewing traumatic events while working within a Haitian community that is attuned to the symptoms of this syndrome can actually given rise to these culture-bound symptoms:

'I remember over and over, when I was a UN Human Rights Monitor and I was down there in Port-au-Prince viewing cadaver after cadaver left by the Haitian army, people would say, "Now go home and lie down or you will have Seizisman." And I never really had a problem, you know? I never threw up or fainted no matter what I saw, but I started to feel "stressed", which is an American illness defined in an American way. After viewing one particularly vile massacre scene, I went home and followed the cultural model I had been shown. I lay down, curled up, and went incommunicado. "Ah-hah! Seizisman!" said the people of my household' (Nicolas, DeSilva, Grey and Gonzalez-Eastep, 2006: 705).

(Source: Davey, 2008)

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these kinds of beliefs and activities are representative of mental illness.

Second, it is difficult to use cultural norms to define psychopathology because cultural factors seem to affect known psychological problems in very complex ways. For example:

1 social and cultural factors will affect the vulnerability of an individual to causal factors (e.g. poor mental health is more prevalent in low income countries) (Desjarlais et al., 1996)
2 culture can produce 'culture-bound' symptoms of psychopathology which seem confined to specific cultures and can influence how stress, anxiety and depression manifest themselves. Two examples of such 'culture-bound' effects are described in Focus point 32.3, and these are known as 'Ataque de nervos', a form of panic disorder found in Latinos from the Caribbean (Salman et al., 1998), and 'Seizisman', a state of psychological paralysis found in the Haitian community (Nicolas et al., 2006)
3 society or culture can influence the course of psychopathology for example, schizophrenia in developing countries has a more favourable course and outcome than in developed countries (Weisman, 1997).

"I keep having this terrible nightmare, that I'm really a legal secretary from Croydon with a Wagner fixation."

Maladaptive behaviour

It is often tempting to define psychopathology in terms of whether it renders the individual incapable of adapting to daily living, and, in particular, whether its manifestation is harmful to the individual or to others. There are some examples of psychopathology that clearly fit this definition – suicide is a good example, and so are many of the psychotic symptoms typical of schizophrenia, where the thought-disordered individual is unable to understand and respond adaptively to the world. It is also true that most psychological problems for which people seek treatment are characterised by the individual being unable to continue with their normal day-to-day living (Wakefield, 1992). However, while many forms of psychopathology may fit this definition, there are many other forms of behaviour that we can define as maladaptive, but we would not want to label as forms of psychopathology. The behaviour of most murderers, for example, is certainly harmful to others, but it is only rarely the case that murderers commit their crimes because they are suffering from mental health problems. The same could be said for most forms of criminal and antisocial behaviour. In addition, it can be argued that some forms of psychopathology may be *adaptive* rather than maladaptive. For example, a case can be made for suggesting that phobias such as height phobia, water phobia, snake phobia and even spider phobia are adaptive responses which help us to avoid potentially harmful situations (Seligman, 1972).

Distress and impairment

Later in this chapter we will be looking at the ways in which psychologists and psychiatrists have classified psychopathology, and, in order to be classified as a psychological disorder, one of the main requirements of symptoms is that they must cause 'clinically significant distress or impairment in social, academic, or occupational functioning'. It is clearly the case that individuals with severe psychological problems do suffer considerable personal distress, and that this can severely affect their day-to-day living. Witness the fact that psychological problems can often be so distressing that they lead the individual to radical actions, such as attempting suicide (see Chapter 33). Personal distress and disruption of day-to-day living are now considered to be important defining features of psychopathology (but see Wakefield, 1992), and are factors that are enshrined in the diagnostic criteria for most disorders. However, to be indicative of psychopathology, distress and disruption must be a relatively *chronic* feature of the problem, and must have a significant psychological or cognitive component. For example, many medical conditions, such as cancer, can cause significant distress and disruption to daily life – yet we would not want to consider cancer as a psychological disorder! Psychological problems may be one of the outcomes of severe medical conditions (e.g. cancer, AIDS), and the relatively new area of Health Psychology has been developed in part to help analyse and deal with the psychological consequences of what are primarily medical disorders (see Chapter 35).

Self-test:

- What are the problems with using statistical norms to define psychopathology?
- How do cultural factors make it difficult to define psychopathology in terms of deviations from social norms?
- What are the pros and cons of using maladaptive behaviour or distress and impairment as means of defining psychopathology?

Classifying psychological disorders

At this point you may be saying to yourself 'why try to define and classify psychopathology at all?' Nevertheless, there are some good reasons for wanting to do this. First, as a social and biological science, psychology will want to try to understand the causes of mental health problems. This is important so that we can develop effective treatments that address the root causes of psychopathology and also develop prevention strategies designed to reduce the risk of individuals developing symptoms of psychopathology. Most sciences use classification to group phenomena into categories according to their similarities. Categorisation and classification is thus an important first stage in the pursuit of knowledge about causes and aetiology, and it would be difficult to discuss aetiology in this book if there were not some form of classification that enabled us to understand how different causes relate to different symptoms. Second, classification is necessary if we are to effectively organise services and support for sufferers. For example, the needs of individuals with intellectual disabilities, major depression, an anxiety-based disorder, or substance dependency are all very different, and require different approaches and different means of support and intervention. Third, how do we decide if our interventions and support for sufferers have been effective unless we have some objective way of defining what constitutes the symptoms of psychopathology? One important and objective way of determining whether an individual is responding to treatment is to see if there has been any improvement in objectively defined and measurable symptoms. Finally, whether we like it or not, modern day society requires that we assess and classify people for a number of reasons, and this is also the case with psychopathology. For example, we might want to know whether a person is psychologically fit to stand trial for a criminal offence, whether a child has disabilities that will require special educational needs, or whether financial compensation or damages should be awarded to an individual because of psychological symptoms caused by the actions of others. All of these requirements of modern society necessitate a form of assessment and classification that can adequately and objectively deal with these kinds of issues.

The development of classification systems

The very first extensive systems for classifying psychopathology were developed by the World Health Organization (WHO), which added psychological disorders to the International List of Causes of Death (ICD) in 1939, and the American Psychiatric Association (APA), which first published the Diagnostic and Statistical Manual IV (DSM-IV) in 1952. The DSM has now come to be accepted as the most influential diagnostic system in most developed countries, and has been revised several times up to the publication of the most recent version, DSM-IV-TR, in 2000 (TR means ‘Text Revision’).

FOCUS POINT 32.4

The DSM-IV definition of psychological disorders

‘In DSM-IV, each of the mental disorders is conceptualized as a clinically significant behavioral or psychological syndrome or pattern that occurs in an individual and that is associated with present distress (e.g. a painful symptom) or disability (i.e., impairment in one or more important areas of functioning) or with a significantly increased risk of suffering death, pain, disability, or an important loss of freedom. In addition, this syndrome or pattern must not be merely an expectable and culturally sanctioned response to a particular event, for example, the death of a loved one. Whatever its original cause, it must currently be considered a manifestation of a behavioral, psychological, before biological dysfunction in the individual. Neither deviant behavior (e.g. political, religious, or sexual) nor conflicts that are primarily between the individual and society are mental disorders unless the deviance or conflict is a symptom of a dysfunction in the individual.’

(Source: DSM-IV, pages xxi–xxii).

DSM-IV-TR

Defining mental disorder

Before attempting to classify psychological disorders it was necessary for DSM to define what it considered to be a mental disorder. As we have already seen, this is not easy nor is it clear cut, but DSM did attempt to rule out behaviours which were purely socially deviant as symptoms of psychopathology, and put the emphasis on *distress* and *disability* as important defining characteristics. Focus point 32.4 shows the relevant section from DSM-IV that attempts to define what should be classified as a mental disorder.

The dimensions of classification

DSM-IV-TR encourages clinicians to rate individuals on five separate dimensions, or axes; these dimensions of classification are listed in Table 32.2. Axes I and II cover the classification of psychopathology, with Axis I comprising the majority of common diagnostic categories such as anxiety disorders, depression, and schizophrenia. Axis II consists of personality disorders and learning difficulties (mental retardation), and covers problems that may be more chronic and long-term. Practitioners are encouraged to explore the possibility that sufferers may have both an Axis I and Axis II disorder, because if they do, then the Axis I disorder may be significantly more difficult to treat.

Axes III, IV and V are not usually required to make a psychopathology diagnosis, but were included so that a fuller appreciation of an individual’s life situation could be made. As we will see later, it is just as important to define what we mean by psychological health, as it is to define psychological disorder.

Problems with classification

While DSM-IV-TR provides an objective and reliable set of criteria by which psychopathological symptoms can be diagnosed, it is in many senses imperfect. First, it does not define disorders in terms of their causes, and this leaves open the possibility that disorders that may look the same on the surface (and so may be classified as the same disorder), may have different causes, and therefore require different forms of treatment. Also, diagnosis on the basis of symptoms gives the illusion of explanation, when it is nothing more than a re-description of the symptoms (Carson, 1996). So, to say that ‘she hears voices because she has schizophrenia’ sounds like an explanation, but within

TABLE 32.2 THE FIVE DIMENSIONS OF CLASSIFICATION IN DSM-IV-TR

AXIS I	Clinical Disorders (e.g. anxiety disorders, mood disorders, schizophrenia and other psychotic disorders, etc.) Other conditions that may be a focus of clinical attention
AXIS II	Personality Disorders (e.g. antisocial personality disorder, schizotypical personality disorder, etc.) Mental Retardation
AXIS III	General Medical Conditions (e.g. infectious and parasitic diseases, diseases of the circulatory system, injury and poisoning, etc.)
AXIS IV	Psychosocial and Environmental problems (e.g. problems with primary support group, educational problems, economic problems)
AXIS V	Global Assessment of Functioning

DSM, schizophrenia is merely a collective term for the defining symptoms.

Second, DSM conceptualises psychopathology as a collection of hundreds of distinct categories of disorders, but what happens in practice provides quite a different picture. For example, the discrete, differentially defined disorders listed in DSM regularly co-occur. This is known as comorbidity, where an individual client will often be diagnosed with two or more distinct disorders (e.g. an anxiety disorder such as obsessive-compulsive disorder and major depression). What is interesting is that comorbidity is so common that it is the norm rather than the exception. For example, surveys suggest that up to 79% of individuals diagnosed with a disorder at some point during their lifetime will have a history of more than one disorder (Kessler *et al*., 1994). The frequency of comorbidity suggests that most disorders as defined by DSM may indeed not be independent discrete disorders, but may represent symptoms of either hybrid disorders (e.g. a disorder that contains elements of a number of different disorders) or a more broad ranging syndrome or disorder spectrum that represents a higher-order categorical class of symptoms (Krueger *et al*., 2005).

Third, diagnostic classification (whether it be by DSM or any other system) tends to define psychological problems as discrete entities (after being assessed you will either be diagnosed with the disorder or you will not). However, much recent evidence has begun to suggest that psychopathology may be 'dimensional' rather than discrete (Krueger and Piasecki, 2002). That is, symptoms diagnosed as a disorder may just be more extreme versions of everyday behaviour. For example, we all worry about our own life problems at times – some of us more than others. In extreme cases this activity can become so regular and persistent that it will interfere with our daily living and may meet the DSM-IV-TR criteria for diagnosis as a disorder (i.e. generalised anxiety disorder, see page 624). In such circumstances, the cut-off point for defining an activity such as worrying as a disorder becomes relatively arbitrary. Defining psychopathologies as discrete entities rather than existing on a dimension can also have other negative implications for the sufferer. For example, someone who may just meet the criteria for a disorder is suddenly labelled with that disorder when the individual who might have just failed to meet the criteria is not. This can very much affect how that individual feels about themselves, and how others react to them.

Self-test:

- What is the DSM classification system primarily designed to do?
- What are the five axes or dimensions of classification in DSM?
- DSM is not an ideal classification system. Can you describe at least four problems associated with this method of classification.

Good psychological health

So far in this chapter, we have focused on abnormal behaviour, psychopathology, mental illness and psychological disorders, but we must remember that it is often useful to view psychopathology in the light of what we would normally consider to be the criteria for good psychological health. Axis V of DSM-IV-TR attempts to measure the individual's current level of adaptive functioning, and assumes that good psychological health is dependent on adaptive functioning in areas of social relationships, employment, and use of leisure time. In most cases, good psychological health can be indicated by the presence of most of the following attributes: (1) an efficient perception of reality, (2) good self-knowledge and awareness of one's own feelings, (3) the ability to exercise voluntary control over behaviour, (4) good self-esteem, and an appreciation of one's own worth, (5) an ability to form and maintain affectionate relationships with others, and (6) productivity – a positive and planned approach to life.

TABLE 32.3 THE GLOBAL ASSESSMENT OF FUNCTIONING (GAF) SCALE

Score	Criteria
91–100	Superior functioning in a wide range of activities, life's problems never seem to get out of hand, is sought out by others because of his or her many positive qualities. No symptoms.
81–90	Absent or minimal symptoms (e.g. mild anxiety before an exam), good functioning in all areas, interested and involved in a wide range of activities, socially effective, generally satisfied with life, no more than everyday problems or concerns (e.g. an occasional argument with family members).
71–80	If symptoms are present, they are transient and expectable reactions to psychosocial stressors (e.g. difficulty concentrating after family argument); no more than slight impairment in social, occupational, or school functioning (e.g. temporarily falling behind in schoolwork).
61–70	Some mild symptoms (e.g. depressed mood and mild insomnia) OR some difficulty in social, occupational, or school functioning (e.g. occasional truancy, or theft within the household), but generally functioning pretty well, has some meaningful interpersonal relationships.
51–60	Moderate symptoms (e.g. flat affect and circumstantial speech, occasional panic attacks) OR moderate difficulty in social, occupational, or school functioning (e.g. no friends, conflicts with peers or co-workers).
41–50	Serious symptoms (e.g. suicidal ideation, severe obsessional rituals, frequent shoplifting) OR any serious impairment in social, occupational, or school functioning (e.g. no friends, unable to keep a job).
31–40	Some impairment in reality testing or communication (e.g. speech is at times illogical, obscure or irrelevant) OR major impairment in several areas, such as work or school, family relations, judgment, thinking or mood (e.g. depressed man avoids friends, neglects family, and is unable to work; child frequently beats up younger children, is defiant at home, and is failing at school).
21–30	Behaviour is considerably influenced by delusions or hallucinations OR serious impairments in communication or judgment (e.g. sometimes incoherent, acts grossly inappropriately, suicidal preoccupations) OR inability to function in almost all areas (e.g. stays in bed all day, no job, home or friends)
11–20	Some danger of hurting self or others (e.g. suicide attempts without clear expectation of death, frequently violent, manic excitement) OR occasionally fails to maintain minimal personal hygiene (e.g. smears faeces) OR gross impairment in communication (e.g. largely incoherent or mute).
1–10	Persistent danger of severely hurting self or others (e.g. recurrent violence) OR persistent inability to maintain minimal personal hygiene OR serious suicidal acts with clear expectation of death.
0	Inadequate information

Taken from DSM-IV (1994), p32.

Table 32.3 shows the Global Assessment of Functioning (GAF) Scale that is used to assess adaptive functioning, and this acts as a measure of psychological health that can be contrasted, when required, with measures of psychological dysfunction and clinical diagnoses.

Learning outcomes

When you have completed this chapter, you should be able to:

1 Discuss from an historical perspective how the concept of madness has developed.
2 Compare and contrast the usefulness of a variety of definitions of abnormality.
3 Describe the basic features of a system for classifying psychological disorders such as DSM-IV.
4 Compare and contrast a number of different approaches to the explanation of psychopathology.

Further reading

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Essay titles and references

1 How do cultural factors affect both our definition of psychopathology and our attempts at diagnosis?

2 Is the presence of personal distress and impairment necessary for identifying symptoms as examples of psychopathology?

3 What are the problems for the practising clinician of using a diagnostic system that does not classify psychopathology according to its causes?

4 Is psychopathology simply a more extreme form of normal behaviour?

5 What are the important similarities and differences in the ways that different psychological models conceive of psychopathology?

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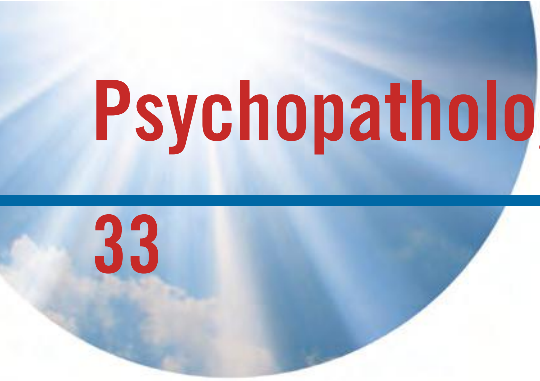

Psychopathology and health psychology

33

Psychopathology and its causes

Route map of the chapter

This chapter describes some of the main forms of psychopathology and discusses contemporary accounts of their causes (aetiology). It is divided into five main sections covering anxiety disorders, mood disorders, schizophrenia, personality disorders and eating disorders. These topics are chosen because they represent some of the most prevalent and most thoroughly researched psychopathologies (e.g. depression, anxiety disorders and schizophrenia), and they also represent psychopathologies that are of contemporary interest, either because of media interest (e.g. eating disorders) or because they give the reader an insight into broader ethical and political issues related to psychopathology (e.g. PTSD).

Introduction

In Chapter 32 we discussed many of the important matters that surround how psychopathology is understood and defined. We now turn our attention to some of the specific issues that face clinical psychologists and psychotherapists when it comes to diagnosing and explaining various psychological problems.

In a textbook of this nature, there is not enough space to discuss all of the psychopathologies listed in DSM-IV-TR, but this chapter presents a selection of the most common and prevalent problems. In the case of each of these psychopathologies, we will discuss both their symptoms and a selection of the most recent theories that attempt to explain how they are caused and what maintains them.

Anxiety disorders

All of us experience anxiety at some time or other, and we are also aware that the intensity of this sensation can differ depending on the situations in which we experience it. Anxiety is a feeling of apprehension or fear, usually resulting from the anticipation of a threatening event or situation. It is often accompanied by various physiological symptoms that may include muscle tension, dry mouth, perspiring, trembling and difficulty swallowing. In its more chronic form, anxiety may also be accompanied by dizziness, chronic fatigue, sleeping difficulties, rapid or irregular heartbeat, diarrhoea or a persistent need to urinate, sexual problems, and nightmares.

Most people experience feelings of anxiety quite naturally in many situations – such as just before an important exam, while making a presentation at college or work, at an interview, or on a first date. Most anxiety reactions are perfectly natural, and are essential for us to perform effectively in challenging circumstances. However, anxiety can often become so intense or attached to inappropriate events or situations that it becomes maladaptive and problematic for the individual. This is when an anxiety disorder may develop. An anxiety disorder is an excessive or aroused state characterised by feelings of apprehension, uncertainty and fear. The anxiety response (1) may be out of proportion to the threat posed by the situation or event (e.g. in specific phobias), (2) may not be easily attributable to any specific threat (e.g. in generalised anxiety disorder, or some forms of panic disorder), and (3) may persist chronically and be so disabling that the individual is unable to continue normal day-to-day living. The following sections discuss the most common forms in which anxiety manifests itself as a diagnosable anxiety disorder.

Specific phobias

Phobias are normally defined as an *unreasonable fear of a particular situation or object*, and they are extraordinarily common, with surveys suggesting that a clear majority of the general population (60.2%) experience ‘unreasonable fears’ (Chapman, 1997). Around 15% of people will meet clinical (DSM-IV-TR) criteria for a simple phobia within their lifetime, which suggest that severe and disruptive phobic symptoms can be quite common. Phobics are normally aware that their fear to the phobic situation or event is excessive or unreasonable (in comparison either with the actual threat it represents or with the less fearful responses of other people), but they do acquire a strong set of ‘*phobic beliefs*’ which appear to control their fear (Thorpe and Salkovskis, 1995). These beliefs normally contain

Photo 33.1 Most people have a phobia of some kind, but there are some unusual ones – such as a fear or anxiety of cotton wool or of buttons. Both of these odd phobias are more common than you think!

information about why they think the phobia is threatening and how to react when they are in the phobic situation (e.g. avoid contact).

The nature of specific phobias

Common phobias tend to focus on a relatively small group of objects and situations, and the main ones are animal phobias (including fear of snakes, spiders, rats, mice, cockroaches, and invertebrates, such as maggots and slugs), social phobia, dental phobia, water phobia, height phobia, claustrophobia, and a cluster of blood, injury and inoculation fears – known as BII. Most other types of phobias are less common, and can be thought of as quite unusual given the degree of threat they might realistically pose – such phobias include fear of cotton wool, buttons, chocolate, dolls and vegetables (see McNally, 1997).

Aetiology – how do we acquire phobias?

Classical conditioning and phobias

Attempts to explain phobias in terms of classical conditioning date back to the famous 'Little Albert' study reported by Watson and Rayner in 1920. Albert was an 11-month-old child, and Watson and Rayner attempted to condition in him a fear to his pet white rat. They did this by pairing the rat (the conditioned stimulus, CS) with a loud noise produced by striking an iron bar (the unconditioned stimulus, UCS). After several pairings of the rat with the noise Albert began to cry whenever the rat was introduced into the room. This type of explanation of phobias has been common over the past 80 years or so, and certainly seems capable of explaining the acquisition of some phobias where the phobic event or object has been associated with a traumatic experience (e.g. dental phobia, choking phobia, most dog phobias).

Evolutionary accounts of phobias

The fact that phobias tend to be focused on a limited set of fears that seem to have evolutionary significance has led some researchers to suggest that we may be biologically prepared or pre-wired for certain phobias. Two facts are important here: (1) it can be argued that those things that are commonly the focus for phobias are truly dangerous and perhaps life threatening (e.g. heights, water, and venomous animals such as snakes, spiders); (2) they have all been around for many thousands of years, and so through evolutionary selection processes, those of our ancestors who feared and avoided these types of objects and events will have survived and passed their fears on through genetic inheritance to their offspring. The most common of these evolutionary explanations are biological preparedness (Seligman, 1971) and non-associative fear acquisition (Poulton and Menzies, 2002).

These evolutionary explanations appear to explain (1) why many of these phobias appear to be acquired through a normal developmental process without any apparent pairing with trauma during the lifetime of the individual (e.g. Poulton and Menzies, 2002), (2) why many phobias appear to have an inherited component, and (3) why it is more difficult to classically condition fear to something that does not have evolutionary fear significance (e.g. a gun) than to one that does (e.g. a snake) (Hugdahl and Johnsen, 1989). (But see Davey, 2008, Chapter 5 for a critique of evolutionary theories of specific phobias.)

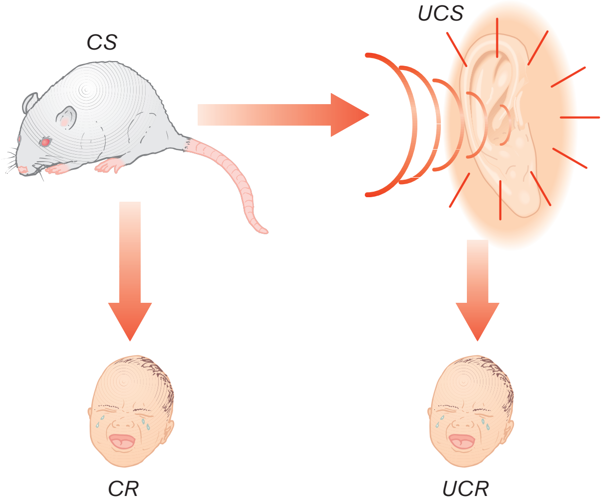

Figure 33.1 The 'Little Albert' classical conditioning study by Watson and Rayner: every time Little Albert was shown his pet white rat (CS), it was associated with a loud noise (UCS); eventually the fear of the noise (UCR) transferred to the white rat (CR)

Multiple pathways to phobias

However, there is no reason why the acquisition of all phobias should be explained by just a single process – and evidence is now accumulating to suggest that different types of phobias are acquired in quite different ways. Some do appear to be acquired through simple classical conditioning processes where the individual has a traumatic experience paired with the subsequent phobic object or event (e.g. dental phobia, choking phobia, dog phobia, accident phobia). Recent studies have also shown that children can acquire fear beliefs about objects through the kinds of *information* they receive about those objects (Field et al., 2001), and this is likely to be a means by which many children acquire transitory fears during vulnerable developmental years.

Other types of phobias appear to have other origins.

- Many **animal phobias** – especially small animal phobias – appear to be related to the **disgust** emotion rather than fear alone (Davey, 2007). People who have a highly developed disgust reaction are likely to be more fearful of a whole range of disgust-relevant animals, and these include snakes, spiders, rats, mice, insects and invertebrates (Davey, 1994b). Disgust is an emotion that has evolved to prevent the spread of disease, and it is hypothesised that we tend to be fearful of these kinds of animals because they have historically been associated with the spread of disease (e.g. rats, cockroaches) or because they possess features which naturally elicit disgust (e.g. they are perceived as slimy, such as snakes and slugs).
- **Situational phobias**, as the name suggests, are a group of phobias that are focused on specific situations (e.g. height, water and claustrophobia). In most cases, these phobias do not have a history of trauma, but are closely associated with panic and **panic attacks** (Antony et al., 1997). There is evidence to suggest that they also share some of the same features as panic disorder, and may develop because the individual has learnt to catastrophically misinterpret bodily sensations when in the phobic situation (e.g. when in an enclosed space or high up) (Davey *et al*., 1997).

Summary of specific phobias

Phobias are common, but it must be remembered that many people can live with their phobias – either because they are sub-clinical in intensity or their fears are so specific that they do not interfere substantially with their daily lives. Our discussion of the aetiology of phobias suggests that specific phobias may have a number of different causes – depending on the nature of the phobic stimulus or event – and the aetiologies appear to involve quite different vulnerability factors and psychological processes.

Self-test:

- What are the most common phobias, and what are the kinds of *phobic belief* that accompany them?
- How do classical conditioning and evolutionary theories attempt to explain the acquisition of phobias? What are their similarities and differences?

Panic disorder

The nature of panic disorder

As the name suggests, panic disorder is characterised by repeated panic or anxiety attacks. These attacks are associated with a variety of physical symptoms, including heart palpitations, perspiring, dizziness, hyperventilating, nausea, and trembling. In addition, the individual may experience real feelings of terror or severe apprehension, and depersonalisation (a feeling of not being connected to your own body or in real contact with what is happening around you). Most people will experience at least one panic attack in their lifetime, but panic disorder is diagnosed when recurrent, unexpected panic attacks keep occurring, and are followed by at least one month of persistent concerns about having a further attack. For some individuals panic attacks are unpredictable, but for others they may become associated (perhaps through classical conditioning, see Chapter 8) to specific situations or events (e.g. riding on public transport).

At least 1.5% of the population will be diagnosed with PD during their lifetime, and it is twice as common in women as men. PD is closely related to agoraphobia (a cluster of fears of being in public places and unable to escape to a

FOCUS POINT 33.1

The experience of panic disorder

'It started 10 years ago. I was sitting in a seminar in a hotel and this thing came out of the clear blue. I felt like I was dying.'

'For me, a panic attack is almost a violent experience. I feel like I'm going insane. It makes me feel like I'm losing control in a very extreme way. My heart pounds really hard, things seem unreal, and there's this very strong feeling of impending doom.'

'In between attacks there is this dread and anxiety that it's going to happen again. It can be very debilitating, trying to escape those feelings of panic.'

'When a panic attack strikes, most likely your heart pounds and you feel sweaty, weak, faint, or dizzy. Your hands may tingle or feel numb, and you might feel flushed or chilled. You may have chest pain or smothering sensations, a sense of unreality, or fear of impending doom or loss of control. You may genuinely believe you're having a heart attack or stroke, losing your mind, or on the verge of death. Attacks can occur any time, even during nondream sleep. While most attacks average a couple of minutes, occasionally they go on for up to 10 minutes. In rare cases, they may last an hour or more.'

Source: //www.algy.com/anxiety/panic.html

TABLE 33.1 THE HYPERVENTILATION MODEL OF PANIC DISORDER

‘The hyperventilation model posited by Ley (1976) suggests that panic results from dysfunctional breathing patterns which cause chronic hyperventilation. The theory maintains that stress-induced arousal produces an increase in the volume of air breathed so that respiration exceeds metabolic demands. As a result body tissue suffers excess loss of CO_2, the direct result of which is an increase in blood pH and a decrease in arterial CO_2 tension. The increased blood pH reduces the amount of oxygen that hemoglobin can release to body tissue (hypoxia) while reduced CO_2 in the blood reduces the caliber of the arteries, thus impeding the flow of blood to body tissue (ischaemia). In order to compensate for the decreased CO_2 and increased pH the heart has to beat with greater rapidity and power. Heart palpitations, shortness of breath and breathing difficulties follow, with intensity of symptoms a direct consequence of the degree of hyperventilation.’

Source: R. J. Edelmann, *Anxiety: Theory, Research and Intervention in Psychology*, pp. 84–85.
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‘safe’ place), and up to half those diagnosed with PD will usually also suffer agoraphobia.

The aetiology of panic disorder

Interestingly, current theories of panic disorder can be conveniently categorised as either biological or psychological. Because of the intense nature of the physical symptoms of panic disorder, some clinicians believe the causes lie in biological factors (e.g. the physical effects of hyperventilation, Ley, 1987). However, others have argued that panic disorder is caused primarily by cognitive biases in the way that individuals’ interpret ambiguous bodily sensations (e.g. Clark, 1986).

Biological theories

Hyperventilation is a common feature of panic attacks, and Ley (1987) has suggested that dysfunctional breathing patterns may trigger a series of autonomic reactions that precipitate a full-blown panic attack. Hyperventilation is defined as a ‘minute ventilation that exceeds metabolic demand’ and has an end result of raising blood pH level. Oxygen is then delivered less efficiently to body cells, and this can lead to cardiovascular changes that try to help compensate for the lack of oxygen in the cells, and in turn produces the symptoms of panic disorder that are recognised as anxiety (Zvolensky and Eifert, 2001). This type of explanation has been partially supported by evidence from what are called hyperventilation and carbon dioxide challenges, where panic attacks have been induced by administering carbon dioxide-enriched air (CO_2) (Ley and Walker, 1973). Similarly, sensitivity to increases in CO_2 have been suggested as a risk factor for panic disorder (Papp et al., 1993), and have given rise to what are known as ‘suffocation alarm theories’ of panic disorder, where a combination of increased CO_2 intake in particular situations (e.g. riding on public transport) may signal suffocation and give rise to the intense terror and anxiety experience during a panic attack (Klein, 1993).

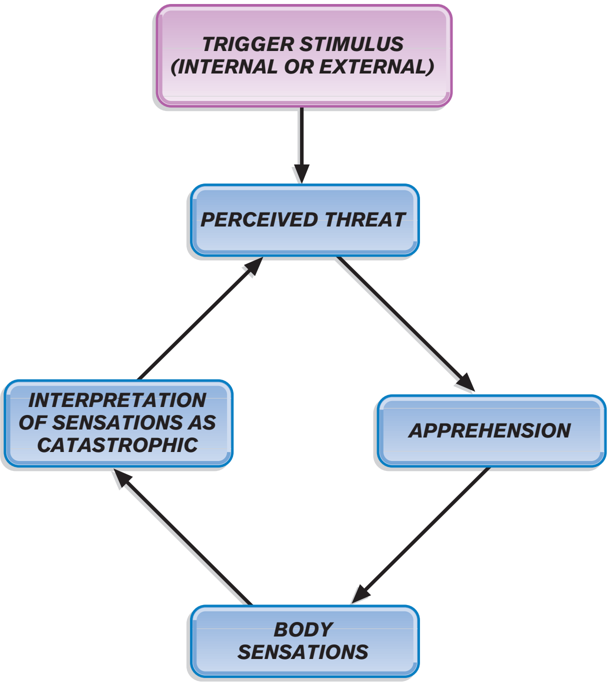
TRIGGER STIMULUS (INTERNAL OR EXTERNAL)
PERCEIVED THREAT
INTERPRETATION OF SENSATIONS AS CATASTROPHIC
APPREHENSION
BODY SENSATIONS

Figure 33.2 Clark’s (1986) psychological model of panic disorder: perception of a threat triggers apprehension and then bodily sensations that are interpreted catastrophically (e.g. ‘I am going to faint or have a heart attack’); this causes further anxiety which feeds into a vicious cycle that triggers a full-blown panic attack

Psychological theories

There are a number of difficulties with those biological accounts of panic disorder that are based on hyperventilation. First, studies that have monitored individuals with panic disorder indicate that hyperventilation occurs in only a small minority of panic attacks, and so could not easily be the cause of the majority of those attacks (Garssen et al., 1996). Second, the sensations and experiences caused by hyperventilation are not always perceived by everyone as threatening and anxiety-provoking – some individuals actually find the lightheadedness and depersonalisation caused by hyperventilation enjoyable and relaxing (Salkovskis and Clark, 1990)! – the kind of exhilarating effect that many people experience, for example, on a roller-coaster ride.

This led British clinical psychologist, David Clark, to propose that panic disorder was caused primarily by the way in which the individual interpreted the bodily sensations they experienced. In particular, many body sensations are ambiguous, e.g. the heart skipping a beat could mean either an imminent heart attack (negative interpretation) or that someone you like has just walked into the room (positive interpretation). However, individuals who tend to develop panic disorder appear to catastrophically misinterpret bodily sensations, that is, they have a cognitive bias towards accepting the more threatening interpretation of their sensations (Clark, 1986). Clark argues that this leads to a vicious cycle where any apprehension is interpreted threateningly (e.g. 'my heart beating faster means I'm going to have a heart attack'), and increases the perceived threat, and leads to an escalation of anxiety symptoms that then precipitate a panic attack. There is a good deal of evidence to support this psychological account. Individuals with panic disorder have been shown to (1) attend to and discriminate their bodily sensations more closely than individuals without panic disorder (Ehlers, 1992), and (2) possess a 'fear of fear' – that is, they find any symptom that may be indicative of fear very threatening and anxiety provoking (Goldstein and Chambless, 1978). In addition, individuals with panic disorder will experience a panic attack when they have been told they will receive a CO_2 challenge, but in fact are given only *compressed air* (Sanderson, Rapee and Barlow, 1989) – suggesting that just the *expectancy* of an attack is enough to trigger one. All of these findings suggest there is likely to be a psychological component to the development of panic disorder that involves a bias in how the individual interprets and reacts to their own bodily sensations. Such psychological accounts of panic disorder have already been successfully used to develop cognitive behavioural therapies for the treatment of this problem (see Chapter 34, Table 34.3).

Summary of panic disorder

All of this evidence suggests there is likely to be an important psychological component to the development of panic disorder that involves a negatively valenced bias in how the individual interprets and reacts to their own bodily sensations. This interpretation bias appears to trigger anxiety, which in turn triggers a panic attack. The issues that remain to be resolved in these accounts are (1) exactly how the anxiety elicited by catastrophic misinterpretation of bodily sensations leads to panic, and (2) why some individuals have acquired high levels of anxiety sensitivity and catastrophic beliefs in the first place.

Self-test:

- How does hyperventilation cause a panic attack?
- What role does the catastrophic misinterpretation of bodily sensations play in the acquisition and maintenance of panic disorder?

FOCUS POINT 33.2

The experience of generalised anxiety disorder

'Lesley readily admitted that she was a "born worrier". She had seen a school counselor at the age of 15 when anxious about examinations, but had not previously received psychological treatment when she was referred for help at the age of 28. Her main complaint at assessment concerned severe headaches, with pain behind her eyes. She was worrying about the possibility that the headaches might never go, and that the pain would interfere with her performance at work. She held a temporary, and junior, post in a small publisher, and in her spare time helped to teach on the introductory copy-editing course that she herself had recently completed. In quick succession she spoke about the potential she believed she had and her fear that she would never be able to realise it. Her ability to do the job well was jeopardised by poor concentration, indecisiveness, and tiredness following nights of disturbed sleep. She was frustrated and angry with herself, as well as anxious about how her work was being appraised. She spent many evenings preparing for her teaching commitments, and no longer had time to go to her exercise class or see her friends.

'Lesley's partner Andrew worked for a local estate agent and she relied on him to listen whenever she was bothered about something. She commented that he did not help her in the right way and no longer seemed to take her worries seriously. They enjoyed the same kinds of music, visiting new places and cooking for friends, when they had time to do it – and when Lesley's worries permitted.'

The example of Lesley shows how chronic and pathological worrying can not only take over all of a person's daytime thoughts, but also have serious deleterious effects on sleep, health, job performance, and relationships.

Source: G. Butler (1994) Treatment of worry in GAD, in Davey G.C.L. (1994) *Worry: Perspectives on Theory, Assessment and Treatment.* Chichester: Wiley, p. 214. Copyright 1994. Copyright John Wiley & Sons Limited. Reproduced with permission.

- Can psychological explanations of panic disorder explain more of the facts of panic disorder than biological explanations?

Generalised anxiety disorder (GAD)

The nature of generalised anxiety disorder

There is unlikely to be a single reader of this textbook who has not worried catastrophically about something at one time or another, and worry is an important activity that is triggered by anxiety. In particular, worry is a central feature of generalised anxiety disorder (GAD) and this disorder is characterised by constant worrisome thoughts and tension about a range of aspects of life and daily routine. The cardinal diagnostic criterion for GAD is excessive or uncontrollable chronic worry that has lasted for at least 6 months. An individual with GAD usually finds it difficult to control their anxiety and their worry, and this may be accompanied by physical symptoms such as fatigue, trembling, muscle tension, headache, and nausea. GAD is twice as common in women than in men, and can often be a disorder that lasts from adolescence to old age (Barlow, Blanchard, Vermilyea, Vermilyea and DiNardo, 1986).

Over 5% of the population will be diagnosed with GAD at some point in their lifetime, and over 12% of those who attend anxiety disorder clinics will present with GAD.

The aetiology of generalised anxiety disorder

The challenge in explaining GAD is to understand why individuals with GAD worry chronically and

TABLE 33.2 CHRONIC WORRIER AND NON-WORRIER TOPICS

	Discomfort	Likelihood
Chronic worrier topic: getting good grades in school		
Catastrophising step	50	30
I won't live up to my expectations.	60	100
I'd be disappointed in myself.	70	50
I'd lose my self-confidence.	70	50
My loss of self-confidence would spread to other areas of my life.	75	80
I wouldn't have as much control as I'd like.	75	100
I'd be afraid of facing the unknown.	75	100
I'd become very anxious.	75	80
Anxiety would lead to further loss of self-confidence.	75	50
I wouldn't get my confidence back.	75	80
I'd feel like I wouldn't have any control over my life.	75	80
I'd be susceptible to things that normally wouldn't bother me.	80	80
I'd become more and more anxious.	85	30
I'd have no control at all and I'd become mentally ill.	50	30
I'd become dependent on drugs and therapy.	85	50
I'd always remain dependent on drugs.	85	100
They'd deteriorate my body.	85	100
I'd be in pain.	90	80
I'd die.	95	80
I'd end up in hell.		
Non-worrier topic: getting good grades in school		
Catastrophising step		
I might do poorly on a test.	3	20
I'd get a bad grade in the class.	3	100
That would lower my grade-point average.	2	100
I'd have less of a chance of getting a good job.	2	60
I'd end up in a bad job.	2	80
I'd get a low salary.	2	100
I'd have less money to spend on what I want.	2	100
I'd be unhappy.	2	35
It would be a strain on me.	2	10
I'd worry more.	2	5

(Source: after Vasey and Borkovec, 1992) pathologically, while many other individuals – often with more stressful lifestyles – worry significantly less. The chronic worrying of those with GAD possesses a number of important features (1) it is always associated with high levels of anxious and depressed mood, (2) it is perceived by the individual as uncontrollable, and (3) individuals with GAD often 'catastrophise' their worries (i.e. make them significantly worse) when they worry about them. Any theory of GAD needs to be able to explain these various features of worrying.

Table 33.2 shows the catastrophising sequences generated by a chronic worrier (top) and a non-worrier (below). These sequences were generated using the catastrophic interview procedure in which the individual is first asked 'What is your main worry at the moment?' In this case both participants replied, 'Getting good grades in school'. The interviewer then passes this response back to the participant by saying 'What is it that worries you about getting good grades in school?' each time the participant responds, the interviewer passes that response back by asking what it is about the response that worries them. The interview continues until the participant can no longer think of any reasons.

By looking at the catastrophising sequences above, we can deduce a number of things about chronic worriers: (1) they produce significantly more catastrophising steps than non-worriers, (2) they experience increasing emotional distress as catastrophising continues, (3) the content of their catastrophising steps becomes more and more threatening and catastrophic.

Biological theories

There is some evidence for a genetic component to both anxiety generally and GAD specifically (Noyes et al., 1992), which suggests that GAD has an inherited component. However, this evidence is somewhat equivocal and does not indicate very clearly what any inherited component might consist of – it certainly does not imply that individuals with GAD are 'born worriers' (Kendler *et al.*, 1992)! In contrast to biological accounts of GAD, most emphasis in research has recently been placed on understanding the cognitive and psychological processes that contribute to excessive and pathological worrying.

Cognitive factors in pathological worrying

Information processing biases in GAD

A good deal of research has now indicated that anxious individuals, and especially those suffering GAD, have a series of information processing biases which appear to maintain their hyper-vigilance for threat, create further sources for worry, and maintain anxiety. For example, individuals with GAD appear to have an information processing bias that causes them to pre-attentively (i.e. rapidly and unconsciously) focus in on any threat-related stimulus, or to selectively attend to threatening stimuli (Mathews and MacLeod, 1994; Mogg and Bradley, 1998), and these characteristics of anxious individuals have been demonstrated using a number of experimental techniques. Recent research that has trained participants to selectively attend to threatening stimuli has demonstrated that this information processing bias actually causes people to feel more anxious, and so the information-processing bias acquired by anxious individuals may also add to their feelings of anxiety (Wilson, MacLeod, Mathews and Rutherford, 2006).

RESEARCH METHODS BOX 33.1

The Emotional Stroop procedure

During the 1980s and 1990s, clinical psychology borrowed a number of very useful experimental techniques from cognitive psychology that allowed researchers to investigate some of the important cognitive processes involved in anxiety and depression.

The Emotional Stroop is one such example, and this procedure allows the researcher to determine whether individuals with anxiety or depression have a bias towards attending to and processing anxiety-relevant or depression-relevant information (e.g. Mogg, Bradley, Williams and Mathews, 1993) – a factor that may maintain their anxious state.

In this procedure, participants are presented with individual words in coloured ink, some of these words are anxiety (or depression) relevant words, and others are emotionally neutral words. For example:

DEATH (an anxiety relevant word)
or
CARPET (a neutral word)

The participant has to name the *colour of the ink* as quickly as possible, and their reaction time is recorded.

The implication of this procedure is that if individuals automatically attend to the meaning of threatening words (such as death), then this will delay them processing the colour and responding to it. So, if there is an attentional bias to anxiety-relevant words, then reaction times to name the *colour* of the word will be slower with anxiety-related words than neutral, control words.

Most Emotional Stroop studies and their associated procedures do indicate that individuals suffering anxiety have an attentional bias towards anxiety-relevant words and stimuli (including anxiety relevant faces, Mogg, Millar and Bradley, 2000), and that this attentional bias occurs pre-attentively (i.e. before the individual becomes consciously aware of the meaning of the word).

Beliefs about worrying

The worrying of GAD sufferers appears to be driven by a set of beliefs that worrying is an important and necessary thing to do to avoid 'bad' things happening (Davey, Tallis and Capuzzo, 1996; Wells, 1995; Borkovec and Roemer, 1995). This suggests that, for pathological worriers, worrying serves a very specific function, and this gives rise to the rather paradoxical situation where worriers feel the need to worry, but yet are aware that such worrying causes them a good deal of emotional discomfort (Davey *et al.*, 1996). Although it is not clear yet what developmental factors help to fashion these global beliefs about worry, cognitive behavioural therapy techniques are being developed which attempt to change these dysfunctional beliefs about worry into functional ones (see Chapter 34).

Dispositional characteristics of worriers

While there is still some way to go in understanding the psychological and developmental processes that lead to individuals becoming pathological worriers, there is a good deal of knowledge available about what kinds of psychological features they possess. For example, worriers are intolerant of uncertainty (Ladouceur, Talbot and Dugas, 1997), are high on perfectionism (Pratt, Tallis and Eysenck, 1997), and have feelings of responsibility for negative outcomes (Wells and Papageorgiou, 1998), all of which suggest they possess characteristics which will drive them to attempt to think about resolving problematic issues. However, worriers also have poor problem-solving confidence (Davey, 1994), and couch their worries in ways that reflect personal inadequacies and insecurities (Davey and Levy, 1998). This contrasting combination of characteristics appears to drive the individual to try to resolve problems, but the process is thwarted by their personal doubt about their own ability to solve them successfully (Davey, 1994).

Summary of generalised anxiety disorder

Generalised anxiety disorder (GAD) is a common psychopathology whose central diagnostic feature is chronic and uncontrollable worrying. A number of psychological factors have been shown to contribute to the anxiety experienced in GAD including biases towards selectively processing threatening information, the development of dysfunctional beliefs about the importance of worrying, and dispositional factors such as an intolerance or uncertainty and poor problem-solving confidence.

Self-test:

- What is the cardinal diagnostic feature of GAD?
- What are the features of worry in GAD that make it a distressing experience for the sufferer?
- How do information processing biases and cognitive factors contribute to the acquisition, maintenance and experience of anxiety in GAD?

Obsessive-compulsive disorder (OCD)

The nature of obsessive-compulsive disorder

We have all on occasions gone back to check whether a door is locked, and we have all experienced a sudden, intrusive thought that we find disturbing and out of place (e.g. harming our own child). But for obsessive-compulsive disorder (OCD) sufferers such experiences are a distressing daily way of life. There are two specific characteristics of OCD. First, OCD is characterised by persistent, intrusive,

TABLE 33.3 DYSFUNCTIONAL BELIEFS IN WORRY

A number of studies have now indicated that pathological worriers possess a very strong and stable set of beliefs about worry being an important activity to indulge in – largely because they believe that if they do *not* worry, then bad things will happen to them.

It is far from clear how worriers have developed this set of dysfunctional beliefs, but it is possible that they are maintained through superstitious reinforcement.

For example, the majority of things that pathological worriers worry about have very low probabilities of actually happening (e.g. a family member is late home, therefore they must have had a serious car accident). When these events don't happen (i.e. the family member turns up late but quite healthy), this implicitly reinforces their belief that worrying actually prevents bad things happening.

The following are some of the positive beliefs that worriers hold about worry being a necessary thing to do.

- Worrying allows me to work through the worst that can happen, so when it doesn't happen things are better
- Worrying leads me to explore different possibilities
- Worrying is a process that helps me to meet new situations
- Worrying makes me reflect on life by asking questions I might not usually ask when happy
- In order to get something done, I have to worry about it

(Source: Davey, Tallis and Capuzzo, 1996)

FOCUS POINT 33.3

The case of Howard Hughes

'It would appear that during his declining years Howard Hughes suffered from a severe obsessional disorder, among many other problems. Although the information is scanty and of unknown reliability, it seems extremely probable that he had a strong obsessional fear of contamination. In order to avoid infection, he constructed for himself a sterile, isolated environment in which his contact with potentially contaminated people was kept to a minimum. For the most part he successfully avoided touching any person or object directly – instead, he covered himself with paper tissues and other protective materials. His barber was required to repeatedly sterilise all of his instruments by immersing them in alcohol. There was a complicated ritual for handling objects. Before handing Hughes a spoon, his attendants had to wrap the handle in tissue paper and seal it with cellophane tape. A second piece of tissue was wrapped around the first protective wrapping to ensure that it would be protected from contamination. On receiving the protected spoon. Hughes would use it only with the handle covered. When he finished with it, the tissue was discarded into a specially provided receptacle. The spoon itself had to be carefully cleaned.

On one occasion he observed that a bottle had been broken on the steps of his range. He wrote out a series of instructions that involved marking out a grid of one-inch squares on each step and then meticulously cleaning one square at a time to ensure that every splinter of glass had been removed.'

(Source: Rachman and Hodgson, 1980, pp. 25–26)

and usually disturbing, thoughts, images or impulses that are known as obsessions. These obsessions in their turn cause anxiety and emotional discomfort that give rise to a set of strategies or rituals designed to alleviate this anxiety. These strategies or rituals are known as compulsions. OCD normally takes one of three prevalent forms: (1) repeated, unwanted thoughts, images or compulsions, (2) compulsive washing, usually to avoid fear of dirt, contamination or illness, and (3) compulsive checking, usually undertaken to ensure that the individual will not be responsible for any potentially harmful event occurring (if, for example, the gas cooker is left on, or the door left unlocked). OCD can also manifest itself less regularly as compulsive hoarding, superstitious ritualised movements, or the systematic arranging of objects (Steketee, Frost and Kyrios, 2003; Radomsky and Rachman, 2004). Often, the compulsive rituals developed during OCD can be so demanding that they significantly interfere with the daily life of both the individual and his or her immediate family.

OCD onset is usually gradual and frequently begins to manifest itself in early adolescence or early adulthood following a stressful event such as pregnancy, childbirth, relationship or work problems (Kringlen, 1970). Recent community surveys have suggested that OCD is more common than was once believed, with around 2.5% of the population being diagnosed with OCD during their lifetime.

The aetiology of obsessive-compulsive disorder

Biological factors

Onset of OCD can be associated with traumatic brain injury or encephalitis (Jenike, 1986), which suggests that there may be a neuropsychological deficit in some forms of OCD. This neurophysiological deficit may give rise to the 'doubting' that things have been done properly – which is a central feature of many forms of OCD. Areas of the brain which have been identified as important in this respect include the frontal lobes and the basal ganglia, but as yet there is no convincing evidence that deficits in the functioning of specific areas of the brain have a direct causal role in the development of OCD. Some neuropsychological studies have indicated that OCD sufferers appear to demonstrate a variety of basic information processing and executive functioning deficits, and these include deficits in spatial working memory, spatial recognition, visual attention, visual memory, and motor response initiation (Greisberg and McKay, 2003). However, while such executive deficits may contribute to 'doubting' that something has been done properly, the evidence is equivocal as to whether these cognitive deficits are linked to any physiological brain dysfunction.

Psychological factors

Memory deficits: 'doubting' is a central feature of OCD, and especially the compulsions associated with the disorder. As a result, it has been suggested that OCD may be characterised by memory deficits that give rise to the doubting that, for example, doors have been locked or hands have been washed properly. Researchers have suggested that OCD sufferers may have (1) a general memory deficit (Sher, Mann and Frost, 1984), (2) less confidence in the validity of their memories (Watts, 1993), or (3) a deficit in the ability to distinguish between the memory of real and imagined actions (Brown, Kosslyn, Breiter, Baer and Jenike, 1994). However, while OCD sufferers do claim to have doubts about their recollection of having either checked or washed properly, recent evidence suggests that lack of confidence in recall may be a consequence of compulsive checking or washing rather than a cause of it (van den Hout and Kindt, 2003; Tolin et al., 2001). In effect, the more we check, the less confident we are about what we have checked.

Inflated responsibility: the most notable of contemporary psychological accounts of OCD are those claiming that

RESEARCH METHODS BOX 33.2

Doing research in clinical psychology

Our understanding of psychological disorders is critically dependent on our ability to undertake scientific research into the factors that cause and maintain these disorders. Many different types of research contribute to understanding psychological disorders, and these include the following:

Survey studies – where epidemiological and demographic factors are investigated (e.g. to see how prevalent a disorder is, or if it affects people from different social backgrounds or in from different parts of the country)

Questionnaire studies – many validated questionnaires have been developed that measure particular aspects of psychological disorders (e.g. these can be used to measure attributes such as levels of trait anxiety or characteristics such as obsessional tendencies). Such studies often provide correlational information about how various characteristics are related – e.g. measures of low self-esteem and perfectionism are highly correlated with measures of eating disorder (Fairburn et al., 1997; Hewitt et al., 1995). These types of study, of course, do not imply a causal relationship between these variables, but they do suggest relationships that may be worthy of further research.

Qualitative methods and discourse analysis – one of the important first steps in understanding a particular disorder is understanding its *phenomenology* – that is, what do individuals with a particular disorder actually experience? Using qualitative methods (such as structured interviews) can help achieve this. Understanding the phenomenology of a disorder is often crucial to determining how you will proceed in trying to discover its causes and the psychological mechanisms that maintain it.

Retrospective questionnaire studies – we may want to ask whether a history of negative life experiences is a factor that might influence whether someone develops depression, an anxiety disorder or an eating disorder. On some occasions, *retrospective questionnaire studies* have been used to investigate this (e.g. individuals are assessed for current psychological disorders and then asked to recall whether various types of events have happened to them in the past). However, these types of questionnaires are not entirely reliable because (1) people tend to have imperfect memories of past events, and may even have suppressed memories of past negative events, and (2) we know that current levels of anxiety and depression cause information processing biases which will bias such people to interpreting past events as negative, and to more readily recall negative events than individuals who are not suffering anxiety and depression.

Prospective studies – to overcome some of the disadvantages of retrospective questionnaire studies, researchers can use prospective techniques. This involves taking measures of a variety of characteristics at time one (T1) and then again at time two (T2) (these two time points may be only a few weeks apart or a number of years apart). This allows objective assessment of characteristics at T1, and these can then be related to whether an individual has developed a psychological problem at T2.

Experimental psychopathology – one of the most effective ways of discovering whether a variable has a causal effect on a psychological disorder is to experimentally manipulate that variable in controlled conditions. For example, Webb and Davey (1993) wanted to see if the disgust emotion was involved in fear of animals. They did this in the laboratory by assessing participants' fears of a range of animals, then manipulating their levels of experienced disgust (by showing videos with disgust-relevant material such as an open-heart operation), and then seeing if this manipulation had changed the participants' fear levels. It did indeed increase fear to certain types of animals, and they concluded that disgust levels play an important causal role in determining fear levels to these animals.

Analogue studies – it is often very difficult to carry our research on clinical populations because (1) access to clinical populations is often restricted and difficult to obtain, (2) there are important ethical issues in doing research with people suffering distressing disorders – especially if the research might make their symptoms worse, and (3) such individuals are often undergoing treatment or therapy, which may make the results of particular studies difficult to interpret. Because of reasons such as this, much useful clinical research has been carried out on what are known as *analogue populations* – that is, people who are not diagnosed with a disorder. The rationale for this is that many psychological disorders (especially those related to anxiety and depression) are dimensional in nature, and the processes that contribute, say, to making anyone feel mildly depressed are the same ones that contribute to major depression. So what we learn about the factors that influence depression or anxiety in non-clinical populations will also be relevant to understanding clinical depression (Davey, 2003).

inflated responsibility can be a vulnerability factor that generates obsessive and compulsive tendencies (Salkovskis, 1985; Rachman, 1998). Excessive or inflated responsibility is defined as the 'individual's belief in their power to cause harm' (Rheaume, Ladouceur, Freeston and Letarte, 1994), and this inflated responsibility both generates negative affect and motivates the individual to persist with rituals and compulsions until they are fully confident they have avoided negative outcomes (such as avoiding getting contaminated if they are a compulsive washer, or avoiding being burgled if they are compulsive checkers). Inflated responsibility is also hypothesised to play a role in the development of compulsive, unwanted thoughts. For example, most individuals would simply dismiss an intrusive thought about killing their child. However, individuals with inflated responsibility appear to believe that if that thought entered their head, they must be responsible for it. This causes considerable emotional discomfort, leads to attempts to suppress the thought, which then often has the paradoxical effect of projecting it more regularly into the stream of consciousness (Salkovskis, 1985; Rachman, 2002).

Summary of obsessive-compulsive disorder (OCD)

Obsessive-compulsive disorder is a complex and disabling psychopathology that can manifest in a number of different forms (obsessive thoughts or compulsive behaviours). Many of the theories of the aetiology of OCD are designed to address only specific features of OCD rather than represent universal explanations of the disorder. For example, some theories try to explain why 'doubting' is a central feature of OCD (these include both neurophysiological and memory deficit models), and others address why intrusive thoughts become so aversive and uncontrollable (e.g. inflated responsibility). Undoubtedly, a full account of OCD will contain at least some, if not all, of these different elements of explanation.

Self-test:

- Can you describe what *obsessions* and *compulsions* are, and provide some examples of each?
- How have biological theories attempted to explain the obsessions and compulsions found in OCD?
- How does the construct of 'inflated responsibility' help to explain how OCD is acquired and maintained?

Post-traumatic stress disorder (PTSD)

The nature of PTSD

Post-traumatic stress disorder (PTSD) is rather unusual among the anxiety disorders because the diagnostic criteria specify exposure to a traumatic stressor as an essential causal factor. In effect, PTSD is a set of persistent symptoms that occur after experiencing or witnessing a traumatic event such as combat during a war, rape or other types of criminal assault, child abuse, car or airplane crashes, or natural or human-caused disasters. The symptoms of PTSD are somewhat different to those experienced in other anxiety disorders, and can be grouped into three main categories: (1) *increased arousal*, which includes an exaggerated startle response, difficulty sleeping, hypervigilance and difficulty concentrating; (2) *avoidance and numbing of emotions* – the individual will attempt to avoid all situations or events that might trigger memories of the traumatic event, and there is a sense of detachment and lack of feelings of positive emotion; and (3) *re-experiencing* – the individual regularly recalls very vivid flashbacks of events experienced during the trauma, and these images often occur in recurrent nightmares.

The aetiology of PTSD

PTSD is a complex disorder that has a number of very different symptomatic features. Because of this, explanations of PTSD have been many and varied (Brewin and Holmes, 2003; McNally, 2003). Some theories address specific features of the symptomatology (e.g. the flashbacks), and others address the chronicity of the disorder and its emotional phenomenology.

Vulnerability factors

What is interesting about PTSD is that not everyone who experiences a life-threatening trauma develops PTSD, so there may be factors that make some people more vulnerable than others. In this respect, a number of factors have been identified which characterise those individuals likely to develop PTSD after trauma. These include (1) a tendency to take personal responsibility for the traumatic event and the misfortunes of others involved in the event (Mikhliner and Solomon, 1988), (2) developmental factors such as early separation from parents or an unstable family life during early childhood (King et al., 1996), (3) a family history of PTSD (Foy et al., 1987), and (4) existing high levels of anxiety or a pre-existing psychological disorder (Breslau et al., 1997). Low intelligence is also a vulnerability factor (Vasterling et al., 2002), and high IQ is the best predictor of resistance to the development of PTSD (Silva et al., 2000). Since IQ is probably directly related to ability to cope with stress and trauma, these variables may simply reflect this relationship.

Theory of shattered assumptions

Many people develop schemas of the world that portray it as a benevolent, safe place, and the people who live in it as good, moral and well-meaning. Therefore, when a traumatic event occurs which severely challenges these beliefs (e.g. being assaulted by a stranger or injured in a disaster which was not of your own making), the individual is left in a state of shock and conflict. This challenges the individual's core beliefs and leaves them in a state of 'unreality' (Bolton and Hill, 1996; Janoff-Bulman, 1992). However, while this may sound like a reasonable explanation of why some individuals exhibit shock and numbing following trauma,

ACTIVITY BOX 33.1

Controversies in the study of PTSD

In many ways, post-traumatic stress disorder (PTSD) is a controversial topic. Controversy has arisen because of (1) the way it is diagnosed, (2) the potential that individuals have to fake the disorder (especially when they are involved in lawsuits to secure financial compensation for involvement in a disaster or accident), and (3) the issue of whether repressed and then recovered memories of sexual abuse play a role in PTSD. Harvard psychologist, Professor Rich McNally (2003), has reviewed some of these controversial issues in an article in the *Annual Review of Psychology*. They include:

'Conceptual bracket creep' in the definition of trauma – Recent changes in the criteria for diagnosis of PTSD mean that PTSD can be diagnosed if 'the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or *a threat to the integrity of self or others*'. McNally points out that PTSD could now be attributed to someone who (1) merely learns about someone else being threatened with harm, or (2) to a range of non-life-threatening stressors, such as exposure to sexual jokes in the workplace (Avina and O'Donohue, 2002).

Erroneously equating PTSD with merely experiencing stress – After the terrorist attack on the World Trade Center on 11 September 2001, surveys suggested that a majority of Americans were suffering substantial levels of stress as a result of the attack. Technically this would allow almost anyone to claim to have developed PTSD according to the broadened diagnostic criteria, yet it clearly fails to distinguish between normal stress and a psychological disorder.

Faking symptoms of PTSD – It is notoriously easy to fake most of the symptoms of PTSD, and because it is a diagnosis linked to explicit traumatic experiences, there are many cases of individuals faking the disorder in order to obtain financial compensation or damages against those who might have been involved in causing the trauma, or to obtain disability payments (McGrath and Frueh, 2002). Indeed, it is estimated that around 75% of Vietnam war veterans who are currently claiming PTSD compensation are either faking symptoms or never actually saw combat (Burkett and Whitley, 1998).

Recovered memories of trauma – A highly controversial debate has waged for many years now about whether disorders such as PTSD may be caused by traumatic experiences (such as childhood sexual abuse) that are repressed in memory, but then subsequently recovered using contentious techniques like hypnosis (Brown et al., 1998). The jury is still out on this issue, but as McNally points out, there is accumulating evidence that those individuals who claim to have recovered memories of previous trauma are prone to exhibit false memory effects (i.e. in laboratory tests of memory, they claim to recall and recognise items that they have not previously been shown). Indeed, Clancy et al. (2002) found that individuals who had reported being abducted by space aliens also exhibited these false memory effects in the laboratory!

Figure 33.3 Individuals who reported being abducted by space aliens also exhibited false memory effects

the facts do not entirely support it. Paradoxically, it is those who have already experienced the world as an unsafe place (i.e. have experienced previous trauma) who are most likely to develop PTSD, *not* those who have a core belief that the world is safe and benevolent (Resick, 2001).

Emotional processing theory

Foa et al. (1989) have suggested that the intense nature of the trauma in PTSD creates a representation of the trauma in memory that becomes strongly associated with other contextual details of the event (e.g. if a person has been assaulted in an alleyway, subsequently walking down any alleyway would selectively activate the fear network in memory). The avoidance of any contexts that might activate this fear network means that there is little opportunity for the PTSD sufferer to weaken these associations between fear and the everyday cues that will activate that fear. This account of PTSD has been elaborated more recently to take account of the fact that individuals with more rigid pre-traumatic views of the self and the world would be more vulnerable to PTSD (Foa and Riggs, 1993), and the emotional processing theory has been influential in the development and success of prolonged exposure as a therapy for PTSD. Prolonged exposure therapy helps PTSD sufferers to relive their traumatic experiences, and in so doing, weakens the associations between contextual stimuli (e.g. alleyways) and the fear network.

'Mental defeat'

Ehlers and Clark (2000) have suggested that there is a specific psychological factor that is important in making an individual vulnerable to PTSD. This is a specific frame of mind called 'mental defeat', in which the individual sees themselves as a victim; they process all information about the trauma negatively, and view themselves as unable to act effectively (Mayou, Bryant and Ehlers, 2001). This negative approach to the traumatic event and its consequences simply adds to the distress, influences the way the individual recalls the trauma, and may give rise to maladaptive behavioural and cognitive strategies that maintain the disorder. These maladaptive strategies include thought suppression, avoidance of trauma cues, use of alcohol or medication to control anxiety, and abandonment of normal every-day behaviour patterns.

Dual representation theory

A rather different approach to explaining PTSD, called dual representation theory, is that it may be a hybrid disorder consisting of the involvement of two separate memory systems (Brewin, 2001; Brewin, Dalgleish and Joseph, 1996). The 'verbally accessible memory' (VAM) system registers memories of the trauma that are consciously processed at the time. These memories are narrative in nature and contain information about the event, its context, and personal evaluations of the experience. They are integrated with other autobiographical memories and can be readily retrieved. The 'situationally accessible memory' (SAM) system, however, records information from the trauma that may have been too brief to apprehend or take in consciously, and this includes information about sights and sounds, and extreme bodily reactions to trauma. The SAM system is thus responsible for the vivid, uncontrollable flashbacks experienced by PTSD sufferers which are difficult to communicate to others (because these memories are not stored in a narrative form). There is good neuropsychological evidence for the existence of these two separate memory systems and their links with the brain centre associated with fear (the amygdala) (Brewin, 2001). There is also evidence that is consistent with predictions from the dual representation theory (Hellawell and Brewin, 2004).

Summary of post-traumatic stress disorder (PTSD)

PTSD has a number of different features, each of which requires explanation. Some theories have tried to explain some of the specific features of PTSD (such as Dual Representation Theory's attempt to explain specific features such as flashbacks), while others have tried to identify the dispositional features that make some individuals vulnerable to developing PTSD while others do not (e.g. Theory of Shattered Assumptions and 'Mental Defeat').

Self-test:

- Can you describe the main symptoms of PTSD and how they may differ from the symptoms found in other anxiety disorders?
- Can you list some of the important risk factors for PTSD, and describe how they might contribute to the development of PTSD?
- Can you describe the main features of at least two theories of the acquisition of PTSD?

Summary of anxiety disorders

Anxiety manifests itself in many different ways in the various different anxiety disorders – as pathological worrying in GAD, as compulsive ritualised thoughts and actions in OCD, as physical panic attacks in panic disorder, and the re-experiencing of trauma in PTSD. Many of these anxiety problems are precipitated by periods of stress in a person's life (e.g. panic disorder, GAD, OCD), yet we do not yet know why an individual who has experienced a period of life stress will develop one particular disorder (e.g. OCD) rather than another (e.g. panic disorder). This will be an important issue for future clinical research.

Just as the symptoms of these anxiety-based problems are often quite different, so are the theories that try to explain them, and there is certainly no single, unified theory that can convincingly explain the development of anxiety-based problems generally. However, there are some features that are common to these different problems and these may provide some insight into how different anxiety-based problems develop. These features include the information-processing and interpretational biases that accompany most anxiety disorders, and also the dysfunctional beliefs that anxiety sufferers seem to form which maintain their symptoms (e.g. the spider phobic's beliefs that spiders are threatening and harmful, and the GAD sufferer's belief that worrying is an important and necessary activity to engage in).

Mood disorders: depression

Depression is an emotion that everyone will have experienced at some point in their lives. It is usually associated with either some form of loss (e.g. loss of a loved one or loss of a job) or with failure (e.g. failing an important exam). It can be triggered by contextual or external factors, such as inclement, dull weather, or the time of year (e.g. in the case of seasonal affective disorder, SAD). While acute episodes of depression are quite normal and adaptive in response to certain types of life events, for some individuals depression can become a chronic and disabling problem.

Depression is a mood condition that is characterised by sadness, lethargy, low self-esteem, lack of initiative, loss of sleep, appetite, and sexual desire, and is often associated with a general pessimistic view of the world. In western cultures, major depression can affect up to 15% of individuals at some point during their lifetime. A bout of major depression can last between three and nine months if untreated, but around 85% of bouts resolve themselves within one year.

In this section we will look at two important types of mood disorder, and at one of the most distressing outcomes of depression – suicide.

Bipolar disorder

The nature of bipolar disorder

Bipolar disorder – previously known as manic depression – is a form of mood disorder that results in unusual shifts in an individual's mood, energy and ability to function. Swings in mood from extreme mania to severe depression may occur in as short a time as a few hours or, more normally, over a period of several months.

FOCUS POINT 33.4

The experience of bipolar disorder

Descriptions offered by people with bipolar disorder give valuable insights into the various mood states associated with the disorder:

Depression: 'I doubt completely my ability to do anything well. It seems as though my mind has slowed down and burned out to the point of being virtually useless . . . [I am] haunt[ed] . . . with the total, the desperate hopelessness of it all . . . Others say, 'It's only temporary, it will pass, you can get over it,' but of course they haven't any idea of how I feel, although they are certain they do. If I can't feel, move, think or care, then what on earth is the point?'

Hypomania: 'At first when I'm high, it's tremendous . . . ideas are fast . . . like shooting stars you follow until brighter ones appear . . . All shyness disappears, the right words and gestures are suddenly there . . . uninteresting people, things become intensely interesting. Sensuality is pervasive, the desire to seduce and be seduced is irresistible. Your marrow is infused with unbelievable feelings of ease, power, well-being, omnipotence, euphoria . . . you can do anything . . . but, somewhere this changes.'

Mania: 'The fast ideas become too fast and there are far too many . . . overwhelming confusion replaces clarity . . . you stop keeping up with it – memory goes. Infectious humour ceases to amuse. Your friends become frightened . . . everything is now against the grain . . . you are irritable, angry, frightened, uncontrollable, and trapped.'

The causes of bipolar disorder

Bipolar disorder appears primarily to have some important biological determinants. First, there is clearly an inherited component to the disorder, suggested by the fact that bipolar disorder runs in families, and is also associated with an enzyme deficiency and colour blindness associated with genes on the X-chromosome (Hodgkinson, Mullan and Gurling, 1990; Hyman, 1999). Second, there are also important changes in certain brain neurotransmitters when the individual is in either a depressed or manic state. During the depressed state, norepinephrine is low, but increases significantly when the individual becomes manic (Schildkraut, Green and Mooney, 1985). The fact that the switch from depression to mania and vice versa is very rapid leads some researchers to believe that the specific problem in bipolar disorder may be related to how the brain controls the levels of different neurotransmitters (Hirschfeld and Goodwin, 1988).

Major depression (unipolar)

The nature of major depression

When experiencing a major depressive episode, the individual often describes themselves as 'depressed, sad, hopeless, discouraged or 'down in the dumps''. To be diagnosed as major depression, this feeling must persist for most of the day, nearly every day, for at least two weeks, and be accompanied by 'clinically significant distress or impairment in social, occupational, or other important areas of functioning' (DSM-IV-TR).

The causes of major depression

Our understanding of what causes major bouts of depression has progressed significantly over the past 20 years, and a knowledge of the biological factors that can contribute to depression has now been supplemented by a number of psychological theories of why people develop depressed ways of thinking.

Biological causes

Depression and mood disorders have been shown to be reliably associated with abnormalities in the levels of certain brain neurotransmitters, and two neurotransmitters are particularly significant – namely *serotonin* and *norepinephrine* (Delgado and Moreno, 2000), and depression is regularly associated with low levels of both these neurotransmitters. A number of factors led to these findings about the importance of serotonin and norepinephrine levels. First, in the 1950s it was noticed that many medications for high blood pressure also caused depression (Ayd, 1956), and this effect was found to be the result of such medications decreasing brain serotonin levels. The 1950s also saw the development of drugs that significantly alleviated the

CLASS ACTIVITY BOX 33.1

Why are women twice as likely as men to be diagnosed with major depression?

The prevalence rate for a diagnosis of major depression is between 10–25% for women and only 5–12% for men, so what accounts for this major sex difference? You might like to begin a group discussion by asking males and females in your group to say how their experiences as a male or female might influence their susceptibility to developing episodes of major depression.

Prior to your group discussion, you might find it useful to read Volume 74, Issue 1, of the *Journal of Affective Disorders* (2003) that is a dedicated special issue on Women and Depression.

Your discussion may want to take into account the following facts.

- There is no sex difference in the rate of experienced depression prior to age 14–15 years (Nolen-Hoeksema, 2001).
- Women are more likely to ruminate about their depressive symptoms, whereas men tend to try to distract themselves or express their depression as anger (Just and Alloy, 1997).
- After puberty, females tend to be less at ease with the physical changes occurring with their body than do males (Harter, 1999).
- After puberty, women experience more life stressors than men (Hankin and Abramson, 2001).
- Being married and having children increases the risk of Major Depression in women, but not in men (Lucht, Schaub, Meyer, Hapke *et al.*, 2003).

Think about the following possibilities.

- Do women get more depressed than men because they feel they have less control over their lives?
- Are women more likely to blame themselves for failures than men?
- Do Western societies set higher cultural standards for women than men (e.g. body shape standards are more defined for women than men), and do women get depressed when they fail to meet these relatively high standards?
- Are men simply less likely to admit that they are depressed than women?

Researchers are far from agreed as to the reasons why twice as many women as men suffer from depression, so there are no right or wrong answers and your group discussion will add to this ongoing debate.

symptoms of depression. The main ones were *tricyclic drugs* (such as imipramine) and *monoamine oxidase (MAO) inhibitors* (such as tranylcypromine). Both of these drugs have their effects by increasing levels of both serotonin and norepinephrine in the brain. These findings led to the development of neurochemical theories of depression that argued that depression was caused by either low norepinephrine activity (Bunney and Davis, 1965) or low serotonin activity (Golden and Gilmore, 1990). Because these neurotransmitters are necessary for the successful transmission of impulses between neurones, their abnormally low levels in depressed individuals may account for the cognitive, behavioural and motivational deficits found in Major Depression.

Tricyclic drugs have their beneficial effects by preventing the reuptake by the presynaptic neurone of serotonin and norepinephrine. This results in higher levels of these neurotransmitters in the synapse, and this facilitates the transmission of impulses to the postsynaptic neurone – thus facilitating brain activity. More recently, the development of *selective serotonin reuptake inhibitors* (SSRIs such as Prozac) has allowed researchers to assess the specific role of serotonin in depression, and researchers now believe that serotonin levels play a central role in major depression. However, this picture is relatively simplistic, and the most recent neurochemical theories of mood disorders suggest that interactions between different neurotransmitters may be important. Some researchers suggest that depression is associated more with an *imbalance* in neurotransmitters than with deficits in specific neurotransmitters (Rampello, Nicoletti and Nicoletti, 2000).

Psychological and cognitive factors

Beck's cognitive therapy

Aaron Beck was probably the most influential of all theorists attempting to understand depression in the latter part of the twentieth century. He was arguably the first to suggest that depression was linked to a chronic way of thinking about the world, rather than about either fixation on a stage of psychodynamic development, as Freud had suggested, or simply the result of biological imbalances in the body. Beck (1967, 1987) suggested that the thinking of depressed individuals was biased towards negative interpretations. In particular, their thinking was negatively biased in three specific areas. They had negative views of *themselves* (e.g. 'I am unattractive'), negative views of their *future* (e.g. 'I will never achieve anything'), and of the *world*

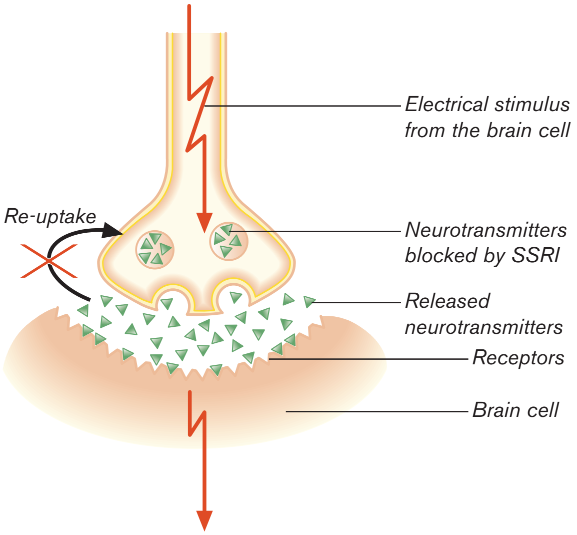
Electrical stimulus from the brain cell
Re-uptake
Neurotransmitters blocked by SSRI
Released neurotransmitters
Receptors
Brain cell

Figure 33.4 Neurones release the neurotransmitters serotonin and norepinephrine from their endings when they fire and these help transmission between brain cells. Some of the neurotransmitter molecules are recaptured by the neurone using a re-uptake mechanism, and this can occur before they are received by the receptor neurone, thus weakening the transmission between neurones. Both tricyclic drugs and SSRIs have their effect by blocking the reuptake of these neurotransmitters and so ensure that neural transmission is more effective. Tricyclic drugs block the reuptake of both serotonin and norepinephrine, while SSRIs selectively block the reuptake only of serotonin

(e.g. 'the world is a dangerous and unsupportive place'). These beliefs, known as the negative triad, form the basis of a negative cognitive schema through which the depressed individual views the world and interprets everything that happens to them. These negative schemas eventually generate self-fulfilling prophecies: the depressed individual interprets events negatively, fails to take the initiative, and then inevitably experiences failure. According to Beck's cognitive theory of depression, depression is caused by a set of core dysfunctional cognitive beliefs about the self and the world, and so successful treatment requires that these beliefs should be changed. This has led Beck to develop his highly successful cognitive therapy for depression, which involves replacing negative beliefs with more positive ones.

Learned helplessness theory

During a person's lifetime they may experience a number of unavoidable and uncontrollable negative life events; these may include the sudden death of a close friend or relative, or being made redundant from a job. Seligman (1976) proposed that depression could be linked specifically to these kinds of experiences, and that they give rise to a 'cognitive set' that makes the individual learn to become 'helpless', lethargic and depressed. It is the perceived uncontrollability of these negative life events that is important, and leads the individual to the pessimistic belief that negative life events will happen whatever they do (learned helplessness theory). Seligman (1974) first derived this hypothesis from animal learning experiments in which dogs were first given unavoidable electric shocks, and then subsequently taught to learn a simple avoidance response that would avoid the shocks. He found that dogs that were given these unavoidable electric shocks were subsequently unable to learn the avoidance response and simply lay down in the apparatus and 'quietly whined'. However, while animal experiments on learned helplessness do appear to have a formalistic similarity to human depression, there are a number of reasons for believing that it is not a full or comprehensive account of depression. First, some studies with humans have suggested that prior experience with uncontrollable negative events may actually facilitate subsequent performance (Wortman and Brehm, 1975). Second, many depressed individuals see themselves as being responsible for their failures and losses – yet someone who perceives themselves as helpless should not blame themselves for these events.

Attributional theories: there is a motivation in us all to attempt to understand the events that befall us, and that is particularly true when we experience loss or failure. In psychological terms, how an individual attempts to explain his or her behaviour is known as attribution, and the way in which we attribute causes to events can have an important influence on both our view of the world and ourselves. In particular, Abramson, Seligman and Teasdale (1978) suggested that the way in which we attribute causes to our losses and failures could be an important determinant of whether those events will make us depressed. They specified three features of the way we attribute causes to losses and failures, these are whether the reasons are (1) internal (personal) or external (environmentally caused), (2) stable or unstable (i.e. is the reason likely to be around all the time, or was it just a one off, freak occurrence?), and (3) global or specific (i.e. is the reason likely to cause other failures or losses generally, or is it specific to that one failure?). They argued that individuals are likely to become depressed if they attribute losses and failures to stable and global causes. This is because stable attributions would make the causes of negative life events long term, and the individual might therefore expect more of them. Global attributions, on the other hand, would imply that negative life events should be expected across a whole range of life activities. Finally, attributing losses and failures to internal, personal causes (e.g. 'I failed an exam because I am not very intelligent'), also facilitates depression by generating low self-esteem. Since this theory was formulated, good evidence has accumulated for a relationship between depression and attributional style (e.g. Metalsky, Halberstadt and Abramson, 1987), and attribution theory has provided the basis for more sophisticated models of depression, such as Hopelessness Theory (Abramson, Metalsky and Alloy, 1989)

Hopelessness theory: the attributional/helplessness account of depression has been further refined to account for the

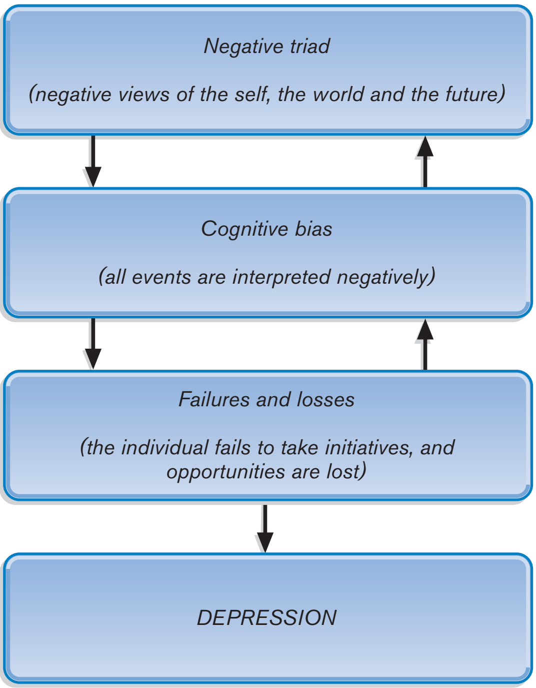
Negative triad
(negative views of the self, the world and the future)
Cognitive bias
(all events are interpreted negatively)
Failures and losses
(the individual fails to take initiatives, and opportunities are lost)
DEPRESSION

Figure 33.5 Beck's negative schema: the self-fulfilling prophecy in cognitive models of depression

fact that attributional style appears to interact with a number of other factors to cause depression. Abramson, Metalsky and Alloy (1989) suggested that the tendency to attribute negative events to global/stable causes represents a diathesis which, in the presence of negative life events, increases vulnerability to a group of depressive symptoms, including retarded initiation of voluntary responses, apathy, lack of energy and psychomotor retardation. This cluster of symptoms is known as hopelessness, which is an expectation that positive outcomes will not occur, negative outcomes will occur, and that the individual has no responses available that will change this state of affairs. Hopelessness theory is very similar to attributional/helplessness accounts in that negative life events are viewed as interacting with a global/stable attributional style to generate depressed symptomatology. However, hopelessness theory also predicts that other factors, such as low self-esteem, may also be involved as vulnerability factors (Metalsky, Joiner, Hardin and Abramson, 1993).

Summary of mood disorders and depression

Depression is arguably the most prevalent of all the main psychopathology symptoms (lifetime prevalence rates are between 5.2–17.1%), it afflicts women twice as frequently as men, and it is estimated that it contributes 12% to the total burden of nonfatal global disease (Ustun, Ayuso-Mateos, Chatterji et al., 2004). It is an emotion that all of us experience at some point – especially in relation to losses and failures in our lives. However, for some it is a sustained, crippling and distressing problem, and may even lead to suicidal ideation, and suicide attempts (see following section).

Suicide and parasuicide

Suicide and parasuicide are included in this section because suicide attempts or suicidal thoughts form part of the diagnostic criteria for major depression. However, suicide attempts usually occur in the context of psychiatric illness generally (90% of suicide victims have a psychological disorder at the time of death), and suicide is not just something that happens to individuals suffering depression. Suicide has been found to be related to diagnoses of depression, schizophrenia, borderline personality disorder, panic disorder and alcoholism (e.g. Isometsa *et al.*, 1995). However, it is worth noting that the large majority of individuals with diagnosed psychological disorders do not commit or attempt to commit suicide (e.g. Frances, Fyer and Clarkin, 1986).

Risk factors for suicide

One of the best predictors of future suicide attempts is a history of at least one previous suicide attempt (Leon *et al.*, 1990). However, since only 20–30% of those who attempt

	Internal (personal)		**External (environmental)**	
Degree	stable	unstable	stable	unstable
Global	I lack intelligence	I am exhausted	These tests are unfair	It's an unlucky day
Specific	I lack mathematical ability	I am fed up with maths	The test is unfair	My maths test was numbered 13

Figure 33.6 Attributional schema of depression: 'Why I failed my GCSE Maths'

FOCUS POINT 33.5

Deliberate self-harm

Self-harm is defined as 'an expression of personal distress, usually made in private, by an individual who hurts him or herself' (UK NICE, 2004). It is now preferred to the term 'attempted suicide' or 'parasuicide' because the range of motives or reasons for this behaviour includes several non-suicidal intentions, and can often be an expression of distress and desire for escape from troubling situations. Rather than employing normal coping strategies, such as talking to a friend or family member about their problem, the individual who self-harms is likely to be withdrawn and depressed, and feels they have no one to turn to. Self-harm is a phenomenon that is not just found with depression, but is also a prominent feature of many other diagnosable disorders, including personality disorders and eating disorders. There is currently no accepted overarching theory of why individuals self-harm, although some theorists suggest that self-harm is reinforced because it enables the individual to escape from or avoid unwanted emotional experiences (Chapman, Gratz and Brown, 2006).

The most common forms of deliberate self-harm include (1) cutting or burning, (2) taking overdoses, (3) hitting themselves, walls or hard objects, (4) pulling hair or picking skin, and (5) self-strangulation. Surveys of adolescent self-harm suggest that around 7% of 15–16 year olds in the UK had deliberately self-harmed in the previous year, but only 12.6% required hospital treatment. Deliberate self-harm was more common in females (11.2%) than in males (3.2%) (Hawton, Rodham, Evans and Weatherall, 2002).

Factors that predict self-harm in adolescent females include recent self-harm by friends, self-harm by family members, drug misuse, depression, anxiety, impulsivity, and low self-esteem, and the two most common reasons for self-harming are 'to find relief from a terrible state of mind' and 'because I wanted to die' (Hawton et al., 2002).

Photo 33.2 Michael Hutchence, formerly lead singer of the Australian rock band INXS, committed suicide in his hotel room in November 1997. Such celebrity suicides are usually followed by a brief increase in suicide rates, which suggests that suicide has a sociological aspect to it, as well as a psychological one.

suicide have made a previous attempt, it is important to look at other risk factors. When risk factors are explored more generally, it is clear that suicide is a complex phenomenon with many potential causes, including social factors, psychiatric factors, psychological factors and familial factors. Recent studies suggest that factors such as subjective depression, hopelessness, suicidal ideation, aggression and impulsivity, a history of physical or sexual abuse, childhood abuse, alcoholism, smoking and drug abuse are all predictors of suicide attempts (Mann et al., 1999; Farber, Herbert and Reviere, 1996).

Psychological factors in suicide and parasuicide

From a review of the known risk factors, it is clear that suicide and parasuicide have a variety of inter-related causes (Mann *et al.*, 1999). Suicide is seen by many as an attempt at problem solving under severely stressful circumstances in which the individual experiences a deep sense of 'hopelessness'. The relatively poor social problem solving skills possessed by individuals in such a state often means that they choose self-annihilation from a very narrow range of alternative solutions (Linehan and Shearin, 1988). But suicide is also a sociological as well as a psychological phenomenon, with media reports of suicide often triggering a significant increase in suicides (Bandura, 1986), and suicide rates differing significantly in different societies and cultures (Cutright and Fernquist, 2000).

Self-test:

- What are the two main mood disorders?

- What role do the neurotransmitters serotonin and norepinephrine play in depression?
- What is Beck's 'negative triad'?
- What is the evidence that depressed individuals hold negative beliefs about themselves and the world?
- What are the benefits and the limitations of learned helplessness as an explanation of depression?
- What kinds of attributions are likely to lead to depressed thinking?
- What are the important features of the Hopelessness Theory of depression?

Schizophrenia

Schizophrenia and experiencing psychosis

One of the most prevalent and severe of all the psychopathologies is schizophrenia (from the Greek schizo *split*, and phrene *mind)*, and it is a psychopathology that is also commonly known as psychosis. The term schizophrenia was first used by the Swiss psychiatrist Eugen Bleuler (1857–1939) to describe the dramatic disturbances in thought and perception that are the main features of this psychopathology. Individuals diagnosed with schizophrenia often cannot tell the difference between what is real and what is imaginary, they may experience hallucinations and delusions, and there are disturbances of the most basic functions that render the individual incapable of feelings of individuality, uniqueness, self-worth and productivity.

The experience of schizophrenia will usually involve many of the following: (1) delusions – strange beliefs that have little basis in reality (you may think you have special powers or that others are spying on you), (2) hallucinations – hearing, seeing, feeling and smelling things that are not there (you may hear voices talking to you or about you), (3) *disordered thinking* – your thoughts will jump between completely unrelated topics, (4) *inappropriate moods or behaviours* – you will do inappropriate things that are entirely out of context (such as taking your clothes off in the supermarket) or express emotions which are inappropriate (such as laughing at a funeral), (5) *lack of insight into the motives and feelings of others* – you will fail to understand why others are doing the things they do, (6) *flat affect* – you will often appear withdrawn, fail to express any emotion, and present a blank expression, (7) *cognitive deficits* – you will have difficulty concentrating, making decisions,

TABLE 33.4 CATEGORIES OF SCHIZOPHRENIA IN DSM-IV-TR

CATEGORY	SUB-CATEGORY	DESCRIPTION
Disorganised Schizophrenia		Disorganised speech, flat affect and shifts of emotion, behaviour is generally disorganised, neglects appearance, and may be incontinent
Catatonic Schizophrenia		Alternate between catatonic immobility and excitement, may echo back the speech of others, states of stupor
Paranoid Schizophrenia	Grandiose Delusions	Exaggerated sense of own importance, power, knowledge
	Delusional Jealousy	Delusions of being persecuted or being spied on, beliefs that partner is being unfaithful
	Paranoia	Delusions of persecution generally
Supplemental Types	Undifferentiated Schizophrenia	Category reserved for those who meet the criteria for schizophrenia, but not for any of the above three categories
	Residual Schizophrenia	Individual shows some signs of the disorder, but no longer meets the full criteria for schizophrenia

planning or remembering things, and (8) *negative mood* – you will feel chronically depressed and anxious.

Schizophrenia is a relatively prevalent diagnosis, with about half a million sufferers in the UK alone, and with around 1–2% of individuals needing treatment for psychotic symptoms at some point in their lifetime. Around 75% of individuals with schizophrenia develop the disorder between 16 and 25 years of age, and onset is uncommon after 30 years and very rare after 40 years of age.

Diagnosing schizophrenia

There is no single specific symptom that is required for a diagnosis of schizophrenia, but as a group, people with schizophrenia do display an identifiable set of symptoms. The symptoms that are most commonly associated with the disorder are called positive symptoms such as thought disorder and hallucinations, and which characterise its main abnormalities. Negative symptoms are arguably less prevalent than positive symptoms, but represent the absence of normal behaviour, and include withdrawal from social contact, flat affect, and lack of emotional expression. DSM-IV-TR describes schizophrenia as 'a disturbance that lasts for at least 6 months and includes at least 1 month of active-phase symptoms (i.e. two [or more] of the following: delusions, hallucinations, disorganised speech, grossly disorganised or catatonic behavior, negative symptoms)' (DSM-IV-TR).

Schizophrenia can be divided into a number of different sub-types depending on the combination and severity of the symptoms. These include (1) Disorganised Schizophrenia, (2) Catatonic Schizophrenia, (3) Paranoid Schizophrenia, (4) Undifferentiated Schizophrenia, and (5) Residual Schizophrenia. Full descriptions of these sub-categories are given in Table 33.4.

The aetiology of schizophrenia

There has always been some disagreement about whether the basic causes of schizophrenia are biological in nature (e.g. the result of imbalances in brain neurochemistry) or whether they are psychological (e.g. resulting from psychological disturbances caused, for example, by life stressors). However, research over the last 30–40 years has indicated that there is almost certainly an inherited component to schizophrenia that is accompanied by abnormalities in brain neurotransmitters, but that psychological factors can affect its severity, its duration, the appearance of certain symptoms (such as paranoid delusions), and the tendency to relapse. Furthermore, life stressors generally may play a role in triggering schizophrenia in vulnerable individuals. This has given rise to a diathesis-stress view of schizophrenia, which suggests that individuals have an inherited vulnerability to the disorder, but that the disorder is only triggered when stressful life events are experienced at particular critical ages (e.g. during early adulthood). Given this view, none of the different theories and explanations outlined below are necessarily competing ones (i.e. one is not necessarily correct and all the others wrong), but they complement each other by explaining different facets of the disorder at different levels of explanation.

Biological explanations

Schizophrenia as an inherited predisposition

While the majority of individuals diagnosed with schizophrenia do not have schizophrenic parents, there is clear evidence that the disorder does run in families. That schizophrenia has an inherited component has been supported by the results of concordance studies. If an individual is diagnosed as schizophrenic, Table 33.5 shows the probability with which a family member or relative will also develop the disorder. This shows that the probability with which the family member or relative will develop schizophrenia is dependent on how closely they are related – or more specifically, how much genetic material the two share in common (Gottesman, McGuffin and Farmer, 1987; Cardno et al., 1999). These types of studies are cited as evidence for an inherited component to schizophrenia, but note that the concordance rates for individuals that have an identical genetic make-up (i.e. identical or monozygotic twins) is far from 100%, which it should be if schizophrenia is *entirely* inherited. This implies that factors other than pure genetic inheritance are involved, and suggests that what is inherited in schizophrenia is a vulnerability to the disorder. Other factors may determine whether that vulnerability is translated into full-blown schizophrenia.

Biochemical factors

Cognition and behaviour is very much dependent on the efficient working of brain neurotransmitters which enable effective communication between brain cells and functionally different parts of the brain itself. It is not surprising, therefore, that many researchers have suspected that the thought disorders, hallucinations and behaviour problems characteristic in the diagnosis of schizophrenia may be caused by malfunctions in these brain neurotransmitters. The biochemical theory of schizophrenia that has been most prominent over the past 50 years is known as the dopamine hypothesis, and this account argues that the symptoms of schizophrenia are importantly related to excess activity of the neurotransmitter dopamine. There are a number of factors that have led to the implication of excess dopamine activity.

First, the discovery of antipsychotic drugs that helped to alleviate the symptoms of psychosis (such as the *phenothiazines*) led to the discovery that such drugs acted by blocking the brain's dopamine receptor sites and so reduced dopamine activity (Schneider and Deldin, 2001). Interestingly, while the administration of antipsychotic drugs alleviated many of the positive symptoms of schizophrenia, such as thought disorder and social withdrawal, they also had the side effect of producing

TABLE 33.5 CONCORDANCE RATES FOR INDIVIDUALS WITH SCHIZOPHRENIA

Relation to Proband	% with Schizophrenia
Spouse	1.00
Grandchildren	2.84
Nieces/nephews	2.65
Children	9.35
Siblings	7.30
Dizygotic (fraternal) twins	12.08
Monozygotic (identical) twins	44.30

Source: After Gottesman, McGuffin and Farmer, 1987

muscle tremors very similar to those seen in Parkinson's disease, and it was already known that Parkinson's disease was caused by low levels of dopamine. In contrast, when people suffering Parkinson's disease were given the drug L-dopa to raise brain dopamine levels, they often began to exhibit psychotic symptoms (Grilly, 2002). This evidence strongly suggests that either high levels of brain dopamine or excess dopamine activity is responsible for many of the symptoms of psychosis. Subsequent research has suggested that many antipsychotic drugs have their effect by binding specifically to dopamine receptors and reducing brain dopamine activity (Burt, Creese and Snyder, 1977).

Second, during the 1970s it was noticed that there was a strong link between excessive use of amphetamines and a syndrome known as 'amphetamine psychosis'. When taken in high doses for long periods of time, amphetamines produce behavioural symptoms in humans and animals that closely resemble symptoms of psychosis. These include paranoia and repetitive, stereotyped behaviour patterns (Angrist, Lee and Gershon, 1974). Subsequently we have learned that amphetamines produce these disturbed behaviour patterns by increasing brain dopamine activity, and giving amphetamines to those diagnosed with schizophrenia actually increases the severity of their symptoms (Faustman, 1995).

Third, brain imaging studies have indicated that individuals diagnosed with schizophrenia show excessive levels of dopamine released from areas of the brain such as the basal ganglia – especially when biochemical precursors to dopamine, such as dopa, are administered to the individual (Carlsson, 2001; Goldsmith, Shapiro and Joyce, 1997).

Finally, post-mortem studies have found increased levels of dopamine and significantly more dopamine receptors in the brains of deceased schizophrenia sufferers – especially in the limbic area of the brain (Seeman and Kapur, 2001).

Psychological explanations

Neo-analytic perspectives

In the 1950s and 1960s, many explanations of schizophrenia were related to dysfunctional family dynamics, and championed by such contemporary psychodynamic theorists such as Gregory Bateson and R.D. Laing. Prior to this, Fromm-Reichmann (1948) had developed the concept of the 'schizophrenogenic mother' – literally a mother who causes schizophrenia! According to Fromm-Reichmann, schizophrenogenic mothers were cold, rejecting, distant and dominating. Such mothers demanded dependency and emotional expressions from their children, but simultaneously rejected displays of affection and even criticised the dependency that they implicitly attempted to foster in their children. This account suggests that when subjected to such conflicting messages and demands from a dominant close relative, the child withdraws and begins to lose touch with reality – at least in part as a way of avoiding the stresses and conflicts created by the mother. A very similar neo-analytical account of schizophrenia is Bateson's (1956) double-bind hypothesis. This is where the individual is subjected within the family to contradictory messages from loved ones (e.g. a mother may both request displays of affection, such as a hug, and then reject them as being a sign of weakness). This leaves the individual in a no-win situation, in which they may then eventually withdraw from all social interaction.

Today, such neo-analytic accounts are considered as only tangential explanations of schizophrenia, and – while dysfunctional family dynamics may be a cause of the stressors that may trigger schizophrenia in vulnerable individuals – they are not considered to be substantial explanations of the disorder.

Paranoia and dysfunctional attribution processes

Of specific interest to cognitive theorists are the delusional beliefs that are regularly developed during psychotic episodes, and over 50% of individuals diagnosed with schizophrenia are diagnosed with paranoid schizophrenia (Guggenheim and Babigian, 1974). This raises the issue of why so many sufferers should develop these particular kinds of delusions. Among individuals diagnosed with schizophrenia who are living in the community, Harris (1987) found that they were 20 times more likely than non-sufferers to report intrusive or confrontational experiences, such as threats from landlords, police enquiries, burglaries and unwanted sexual propositions, so there may be some basis in experience to the development of persecutory beliefs. However, some researchers have pointed out that paranoid delusions may also be the result of abnormal attributional processes, which suggests they have a bias towards attributing negative life events to external causes (Bentall and Kinderman, 1999; Bentall, Corcoran, Howard, Blackwood and Kinderman, 2001). For example, Kaney and Bentall (1989) found that patients with paranoid delusions made excessively stable and global attributions for negative events (just like depressed individuals – see page 493), but also attributed positive events to internal causes and negative events to external causes. These studies all suggest that individuals exhibiting paranoid delusions have had significantly more negative, threatening life events than control individuals without a diagnosis, and have also developed a bias towards attributing negative events to external causes. At the very least, this attributional bias will almost certainly act to maintain paranoid beliefs, and maintain their delusions that someone or something external is threatening them.

Attributional accounts of psychotic delusions have been supplemented by findings that a number of other information processing biases may be involved in the development of delusions and, in particular, persecutory delusions. For example, Morrison (2001) has argued that many individuals diagnosed with schizophrenia have a bias towards interpreting cognitive intrusions as threatening in some way. In this case, a perfectly normal auditory hallucination may then be interpreted as threatening (e.g. 'I must be mad', 'the Devil is talking to me', 'if I do not obey the voices they will hurt me'), and this misinterpretation causes anxiety, negative mood and physiological arousal which produces more hallucinations, which are in turn interpreted negatively, and so on (Baker and Morrison, 1998).

Expressed emotion (EE)

While it is not clear what role family dynamics might have on the development of schizophrenia, it is clear that dysfunctional family dynamics can have an important impact on the duration of symptoms and on recovery from the disorder. A study by Brown et al. (1966) investigated the family life of schizophrenics in London who had been discharged from hospital to live with their families. They found that three aspects of family interactions were important in determining relapse and whether the individual was readmitted to hospital. These were (1) the number of critical remarks made by family members, (2) the

TABLE 33.6 THE GENERAL DIAGNOSTIC CRITERIA FOR A PERSONALITY DISORDER (DSM-IV-TR)

A. An enduring pattern of inner experience and behaviour that deviates markedly from the expectations of the individual's culture. This pattern is manifested in two (or more) of the following areas:

    (1) cognition (i.e. ways of perceiving and interpreting self, other people and events)
    (2) affectivity (i.e. the range, intensity, lability, and appropriateness of emotional response)
    (3) interpersonal functioning
    (4) impulse control

B. The enduring pattern is inflexible and pervasive across a broad range of personal and social situations.

C. The enduring pattern leads to clinically significant distress or impairment in social, occupational, or other important areas of functioning.

D. The pattern is stable and of long duration and its onset can be traced back to adolescence or early adulthood.

E. The enduring pattern is not better accounted for as a manifestation or consequence of another mental disorder.

F. The enduring pattern is not due to the direct physiological effects of a substance (e.g. a drug of abuse, a medication) or a general medical condition (e.g. head trauma).

number of expressions of hostility towards the individual, and (3) the number of comments indicating emotional over-involvement with the individual. Together, these factors have been labelled as a variable called expressed emotion (EE), and high levels of EE have been shown to be related to high levels of relapse and to faster re-hospitalisation (Butzlaff and Hooley, 1998). Most recent research tends to suggest that EE has these effects on relapse rates though a vicious cycle effect in which expressed emotion elicits higher levels of unusual thoughts in the sufferer, and these increased levels of unusual thoughts elicit increasing levels of expressed emotion in family members (Rosenfarb et al., 1994).

TABLE 33.7 DSM-IV-TR CATEGORIES OF PERSONALITY DISORDER

Disorder and prevalence rate in general population	Definition
CLUSTER A ***(Odd/Eccentric Disorders)***	
Paranoid Personality Disorder (2.5% – 4.4%)	An enduring pattern of distrust and suspiciousness of others
Schizoid Personality Disorder (1.7% – 3.1%)	'Loners' who have very few close relationships and fail to express a normal range of emotions
Schizotypal Personality Disorder (0.6% – 3%)	'Eccentric' behaviour marked by odd patterns of thinking and communication
CLUSTER B ***(Dramatic/Emotional Disorders)***	
Antisocial Personality Disorder (APD) (0.7% – 3.6%)	A pervasive pattern of disregard for and violation of the rights of others. Impulsive, irresponsible and dishonest behaviour.
Borderline Personality Disorder (BPD) (0.7% – 2%)	A pervasive pattern of instability of interpersonal relationships, self image, and affects, and marked impulsivity.
Narcissistic Personality Disorder (0.8% – 1%)	A pervasive pattern of grandiosity, need for admiration, and lack of empathy
Histrionic Personality Disorder (1.8% – 3%)	A pervasive pattern of excessive emotionality and attention seeking. Behaviour is often dramatic.
CLUSTER C ***(Anxious/Fearful Disorders)***	
Avoidant Personality Disorder (1% – 5%)	A pervasive pattern of social inhibition, feelings of inadequacy, and hypersensitivity to negative evaluation
Dependent Personality Disorder (0.4% – 1.5%)	Pervasive and excessive need to be taken care of. Submissive and clinging behaviour and great difficulty making everyday decisions.
Obsessive-Compulsive Personality Disorder (OCPD) (1% – 7.7%)	Exceptional perfectionist tendencies including preoccupation with orderliness and control at the expense of flexibility, efficiency and productivity.

Summary of schizophrenia

Schizophrenia is a collection of disparate symptoms that can leave an individual feeling frightened and confused and specific combinations of symptoms may lead to a diagnosis of schizophrenia. Positive symptoms include major disturbances in thought and language, delusional thinking, and sensory hallucinations. The negative symptoms include withdrawal, flat affect, poverty of speech and apathy. The prominent approach to explaining the development of psychotic symptoms is a diathesis-stress one. That is, there is clear evidence for a genetic predisposition to psychotic symptoms, but the symptoms appear to be triggered by experiencing environmental stress.

Self-test:

- Can you name up to eight symptoms that may be characteristic of schizophrenia?
- What is the difference between the positive and negative symptoms of schizophrenia?
- What are the four main sub-types of schizophrenia?
- What is the diathesis-stress perspective that is used to explain the aetiology of psychotic symptoms?
- Concordance studies, twin studies and adoption studies are used to determine the extent of genetic factors in psychosis. Can you give examples of these types of methods?
- What is the dopamine hypothesis and how did the role of dopamine in psychosis come to be discovered?
- A number of cognitive biases have been implicated in the development of some psychotic symptoms. What are these biases and how might they contribute to factors such as delusional thinking?
- What is double-bind hypothesis and how does it try to explain the development of psychotic symptoms?
- What is expressed emotion and what is the evidence that it constitutes a risk factor for the development of psychotic symptoms?

Personality disorders

Classifying personality disorders

As we saw in Chapter 29, Personality is an elusive concept and there are many different ways of categorising and measuring an individual's personality characteristics. Personality traits are considered to be relatively enduring features of the individual that determine how they perceive the world, and how they think about the world, themselves and others. Most people can be adaptable in the way they perceive the world and react to it, but it is when personality traits become inflexible, causing distress to the individual and to others, that they begin to constitute a psychopathology. Table 33.6 shows the DSM-IV-TR general diagnostic criteria for a personality disorder, and the important features of these criteria include (1) behaviour that deviates from that normally expected in a particular culture or society, (2) inflexible behaviour patterns, (3) dysfunctional behaviour patterns that are stable and long lasting and can be traced back at least to adolescence or early adulthood, and (4) behaviour patterns that lead to distress or impairment in a number of important areas of functioning.

Personality disorders are among the most controversial diagnostic categories in clinical psychology, and there is considerable debate about whether functionally different personality disorder categories exist in their own right or whether all personality disorders represent differences of degree rather than kind (e.g. Haslam, 2003; Alwin, 2008). However, DSM-IV-TR has categorised personality disorders into a number of different clusters, depending on their main features, and these main clusters are described in Table 33.7.

There is not space here to discuss all of these different personality disorders, but we will look more closely at one particular category – antisocial personality disorder – as a means to understanding how the behaviour and thinking of some individuals diagnosed with personality disorders can be so radically different from our own.

Antisocial personality disorder (ASPD)

Features of ASPD

The example given in Focus point 33.6 shows how significantly the behaviour of individuals with ASPD can differ from what we consider to be normal standards of social behaviour, morality, and remorse. The main features of DSM-IV-TR that categorise ASPD are 'a pervasive disregard for and violation of the rights of others occurring since the age of 18 years', as indicated by at least three of the following: (1) failure to conform to social and legal norms, (2) deceitfulness and impulsivity, (2) irritability and aggressiveness, (4) consistent irresponsibility (e.g. repeated failures to honour obligations), and (5) lack of remorse. ASPD is also often associated with depressed mood, addiction and dramatic or erratic antisocial behaviour.

ASPD was previously known as psychopathy (hence, the psychopathic personality), but in 1980 the definition of psychopathy was renamed ASPD and defined by radically different criteria. Prior to 1980, psychopathy was defined primarily by personality traits such as egocentricity, deceit, shallow affect, manipulativeness, selfishness, and lack of empathy. But subsequently, ASPD has been defined mainly in terms of violations of social norms. The argument for this shift in diagnostic criteria was that personality traits are difficult to measure, and that it is easier to agree on well-defined behaviours (such as breaking laws, or aggressive behaviour) rather than the reasons why they might occur (such as selfishness, lack of empathy) (Widiger and Corbitt, 1995).

This shift in the diagnostic criteria for ASPD has meant that it has become very closely associated with criminal activity rather than being purely a psychological disorder requiring treatment. APSD is very common in criminal populations (Hare, 1996). For example, a survey of prison populations in 12 Western countries found that 47% of male inmates and 21% of female inmates met the diagnostic

FOCUS POINT 33.6

Antisocial personality disorder

'People with antisocial personality (ASPD) show little or no concern for the rights of others. ASPD is seen about three times as often in males as in females, and symptoms of conduct disorder must appear by the time the person is 15 years old if the person is to be diagnosed with ASPD, which cannot be diagnosed before the person is 18.

'This diagnosis is sometimes given the names "psychopathic personality" or "sociopathic personality" or "dyssocial personality." People with the disorder are deceitful and manipulative; they may be charming and accomplished liars, what we think of as the typical "con man" (or woman). In more extreme cases, they are overt criminals. In either case, they are often arrested, and many people with ASPD are in jail. They are both reckless and irresponsible. They show little ability to plan for or work toward remote goals. They rationalise hurting other people by saying that everyone does it, that the victim deserved it, etc. Much of their antisocial behavior is directed toward obtaining the usual goals – money, sex, and power. Thus their disorder lies not in their goals, but in their means of obtaining them!

'If the person with ASPD lives into his or her forties, her or his aggressive and criminal behaviors are likely to decrease, along with the other symptoms of ASPD. Little is known about whether it can be prevented by giving therapy to high risk children (who show early signs of conduct disorder or attention-deficit/hyperactivity disorder), but there are clear indications that bad parenting increases the probability that conduct disorder will lead to ASPD. It is likely that family and individual therapy for high risk children would be a good bet for both the individual and society.'

Source: http://healthinmind.com/english/antisocl. htm

criteria for APD, and this is around 10 times the prevalence rate found in the general population (Fazel and Danesh, 2002).

The aetiology of ASPD

Because APD is closely associated with criminal behaviour, and on many occasions with violent or homicidal criminal behaviour, there has been a keen interest in attempting to identify risk factors for APD. Identifying potential risk factors might allow clinicians to predict the development of APD from childhood behaviour patterns or childhood experiences. Because personality disorders are enduring patterns of behaviour that persist from childhood into adulthood, one of the best predictors of APD in adulthood is a diagnosis of conduct disorder (CD) during childhood in which the child exhibits a range of behavioural problems that include fighting, lying, running away from home, vandalism and truancy (Farrington, Loeber and Van Kammen, 1990). This, however, begs the question of how such antisocial behaviours had developed in childhood, and we may have to refer back to ineffective parenting practices, discordant and unstable family life, poor peer relationships, and educational failure to trace the origins of these behaviours (Hill, 2003). Persistent and aggressive behaviour before the age of 11-years is also a good predictor of APD in adulthood (Robins, 1966), as is early fighting and hyperactivity (Loeber, Green, Lahey, Frick et al., 2000), and low IQ and low self-esteem (Fergusson, Lynskey and Horwood, 1996). In particular, Loeber, Wung, Keenan et al. (1993) have argued that there are three pathways that predict APD in adulthood. These are (1) an 'overt' aggressive pathway that progresses from bullying to fighting to serious violence, (2) a 'covert' aggressive pathway that progresses from lying and stealing to more serious damage to property, and (3) an 'authority conflict' pathway that progresses through various degrees of oppositional and defiant behaviour. Behaviours in the early stages of each of these pathways predict more serious specific antisocial behaviours later in life (see Davey, 2008, Chapter 11 for more theories of the aetiology of ASPD).

Summary of personality disorders

Personality disorders represent long-standing, pervasive and inflexible patterns of behaviour that deviate from acceptable norms within individual cultures. They are associated with unusual ways of interpreting events (e.g. paranoid and schizotypal personality disorders), unpredictable mood swings (e.g. borderline personality disorder), or impulsive behaviour (e.g. antisocial personality disorder). These patterns of behaviour can be traced back to childhood and early adolescence, and they represent ways of behaving that are likely to have consequences that put the individual at risk for a range of other psychopathologies.

Self-test:

- What are the three clusters of personality disorders listed in DSM-IV-TR, what are the disorders listed in each cluster, and what are their main defining features?
- What are the risk factors and childhood precursors predictive of adult antisocial personality disorder (ASPD)?

FOCUS POINT 33.7

'Insecurity'

A poem written by an Anorexia Nervosa sufferer

Being empty is my only security,
Being empty is my only immunity.
Rejecting food is a desire I cant fight,
Reinforcing hope to which now is far outta sight.

Stabilising my ability to stay in control,
Emptiness comforts me and makes me feel whole.
The coldness perishes my skin,
My blood feels cold against my bones to which I can feel within.

The desire to stay in control is unbearable,
The decisions impossible, confusing me terribly.
My feelings so strong penetrate my thoughts,
Tortured by temptations which I manage to resist, makes my family distraught.

The strength of my soul has disappeared,
Losing my insecurity is truly feared.
Depriving my body is the only thing that keeps me sane,
My head blocks out feelings but my stomach complains.

I ache inside, traumatized, my body feels pain,
For this thing controlling my life I have given a name.
Annie still remains part of my life, part of me,
Something to which I control and is my only security.

No matter how skinny I get I will always want to be thinner,
To me, unless I confront her she'll take over and be a winner.
I feel so alone, like no one understands me,
Please help me get rid of this so called thing (Annie).

My spirit has died, leaving Annie undefeated . . . alive,
Will I ever fight her off?
My body is screaming out for food, for warmth, for hope,
For now I cant cope,
If I don't give in Annie will win allowing her to control me forever.
I just cant bear to eat, so now am I defeated????

Emie

Source: http://www.edauk.com/poetry.htm (copyright)

Eating disorders

Eating disorders is a relatively new category of psychopathology, and reflects the fact that psychological or emotional problems can manifest themselves as severe disturbances in eating behaviour. The most prevalent of these disorders are Anorexia Nervosa (AN) and Bulimia Nervosa (BN). These are normally considered as separate disorders, but both are associated with an obsessive fear of gaining weight and the individual's dissatisfaction with their own body shape (as compared, for example, to media projected ideal images of body shapes). Prior to the 1960s, both AN and BN were relatively rare disorders, but have since become considerably more prevalent in Western societies.

Diagnosing eating disorders

AN is characterised by a refusal to maintain a minimally reasonable body weight, and the DSM-IV-TR criteria for the disorder include (1) refusal to maintain body weight at or above 85% of normal weight for age and height, (2) intense fear of gaining weight or becoming fat, (3) disturbances in normal perception of one's body shape, and (4) in postmenarcheal females, the absence of at least three consecutive menstrual cycles. The modal age of onset is between 14 and 18 years, and onset rarely occurs in females over 40 years. Among females in late adolescence and early adulthood, around 0.5–1% will meet the full criteria for AN.

In contrast, BN is characterised by recurrent episodes of binge eating (at least two episodes a week for a minimum of 3 months), inappropriate behaviours adopted to prevent weight gain (e.g. self-induced vomiting, misuse of laxatives, diuretics, excessive exercise, etc.), and a tendency to consider body shape and weight as overly important in all areas of self-evaluation (i.e. 'If I am overweight, I am not worth knowing'). BN is found to be more prevalent than AN, with 1–3% of adolescent females meeting DSM-IV-TR criteria for BN. Nevertheless, the incidence of both AN and BN have increased significantly over recent years, with a progression from less to more severe disturbances (Wakeling, 1996; Shisslak et al., 1995). Treatments for eating disorders generally are still in their infancy, which means that about one in three of sufferers continue to meet the diagnostic criteria for AN or BN for at least 5 years after initial diagnosis (Fairburn et al., 2000). Sadly, mortality rates (including suicides) in AN and BN are still unacceptably high, ranging from 5–8% (Herzog et al., 2000; Steinhausen *et al.*, 2000).

The aetiology of eating disorders

Biological factors

Because disruptive and avoidant eating practices themselves cause many biological changes in the individual, it is often difficult to determine whether biological factors are the causes or just simply the effects of eating disorders. However, there may be an inherited component in eating disorders as evidenced by some family studies. These studies suggest that eating disorders aggregate in families, and some researchers have suggested that inherited factors may account for between 50–83% of variance in such disorders (Spelt and Meyer, 1995; Klump et al., 2000). However, Polivy and Herman (2002) point out that such studies also seem to suggest that dysfunctional attitudes associated with eating are also inherited, and it is difficult to understand how genes might influence these attitudes.

At least some attempts to explain eating disorders are in terms of neuroendocrine dysfunction (e.g. hormonal dysfunction or life stressors causing hormonal dysfunction), and these accounts allude to the fact that appetite is very sensitive to changes in hormonal levels (Study Group on Anorexia Nervosa, 1995) . The evidence for such causes is weak. First, there is no real evidence for disturbances in the hypothalamus – the brain area responsible for influencing appetite – in individuals with eating disorder (Study Group on Anorexia Nervosa, 1995). Second, it has been suggested that AN and BN may be affected by brain serotonin levels. The argument here is that AN and BN sufferers have behavioural and cognitive traits which are very similar to obsessive-compulsive disorder (OCD) (Pryor et al., 1995), and it is known that serotonin levels influence OCD symptoms. However, individuals who have recovered from AN do not show persistent anomalies in serotonin regulation (O'Dwyer et al., 1996), suggesting that fluctuations in serotonin levels in AN may be an effect of the disorder rather than a cause of it.

The biopsychosocial model of eating disorders

It is very clear that a whole range of factors affect whether an individual will develop an eating disorder, and these include cultural or sociocultural factors (e.g. cultural values relating to thinness), family influences (e.g. the attitudes of mothers to eating), individual experiences (e.g. childhood abuse), and individual psychological characteristics (e.g. body dissatisfaction, perfectionism). These various influences suggest that the aetiology of eating disorders is complex and multi-causal. The following sections describe just a few of these possible influences.

Media and peer pressure

It will not have escaped notice that AN and BN are disorders restricted primarily to females (Striegel-Moore, 1997), and a number of researchers have suggested that these eating disorders are influenced by Western media representations of idealised, slim physiques. While the media in Western cultures are often blamed for broadcasting overly idealised female images, it is clear that most females in these cultures do not develop eating disorders. However, media projection of these ideals may foster feelings of body dissatisfaction that may be an essential precursor to eating disorders (Polivy and Herman, 2002). As with the media, peer pressure is also seen as a contributor to eating disorders, with adolescent girls often under strong pressure to adopt stylised attitudes towards thinness, body shape and eating habits (Levine et al., 1994; Stice, 1998).

Familial influences

Individuals that develop AN and BN often report living in family environments with some very specific negative characteristics. Such factors include parents who exhibit coercive parental control (Haworth-Hoeppner, 2000), mothers who are generally critical, especially about their daughters' appearance (Vanfurth et al., 1996; Hill and Franklin, 1998). The families of eating disordered individuals also tend to be overly concerned with parenting (Shoebridge and Gowers, 2000), and intrusive, hostile and unresponsive to the individual's needs (Minuchin et al., 1978). Such family factors may well foster problems of identity and/or control that in turn may precipitate eating disorders (Polivy and Herman, 2002). However, as Polivy and Herman point out, most of these family studies are correlational in nature and do not imply causation. In addition, if such factors were found to be causally linked to eating disorders, we still do not know how they specifically trigger eating disorders (for example, why should such factors trigger an eating disorder rather than some other emotional or psychological problem?).

Life experience factors

Individuals with eating disorders report significantly more stressful life events than individuals without eating disorders (Raffi et al., 2000), and individuals who have experienced childhood sexual abuse do exhibit an increased tendency to develop BN (Everill and Waller, 1995). However, events such as these may cause eating disorders only indirectly, by influencing susceptibility to depression and anxiety, and other forms of psychopathology (Casper and Lyubomirsky, 1997). For example, such events may cause severely distressing emotions that affect personal identity and lead to eating disorders (Rorty and Yager, 1996) or eating disorders may simply represent ways of coping with these life traumas (Troop, 1998). In fact, a popular account of eating disorders is that control over one's food intake, weight and body shape offers a form of control in a generally hostile and uncomforting world, and it is certainly the case that the need to *control* eating is a central feature of eating disorders generally (Fairburn et al., 1999).

Psychological factors

Individuals with eating disorders share a number of psychological characteristics in common. They have low self-esteem (Fairburn et al., 1997), high levels of negative affect generally (i.e. anxiety and depression) (Ball and Lee, 2000), high levels of perfectionism (Garner et al., 1983), and negative feelings about their body and their body shape (body dissatisfaction (BD)) (Stice, 2001). Of all these factors, BD is the most interesting, and is seen as a direct causal factor in many theories of eating disorders (Polivy and Herman, 1987; Stice, 2001). BD is seen as directly causing bingeing in BN and dieting in AN, and most other sociocultural, familial and experiential factors in eating disorders may have their effect through the way they influence BD. However, there is still more to understanding eating disorders than this, because not everyone who has dissatisfaction with their body or body shape develops an eating disorder. There are clearly other factors which combine with BD to determine whether AN or BN will develop, and these other factors have yet to be clearly identified.

Summary of eating disorders

This section has reviewed the two main eating disorders – anorexia nervosa and bulimia nervosa. Both of these disorders are characterised by dysfunctional eating patterns. Anorexia represents an extreme form of self-starvation while bulimia is characterised by the individual's loss of control over their own eating patterns, and in the case of bulimia, the individual attempts to compensate for frequent binge eating by purging and fasting. The different eating disorders do share a number of factors in common. These include a predominance of female rather than male sufferers, fear of weight gain, the individual's dissatisfaction with their own body shape, and other comorbid psychopathology symptoms such as Major Depression. The section on aetiology shows that these eating disorders often share similar risk factors, and that socio-cultural values relating to body shape ideals may play an important role in initiating weight-regulating behaviours in vulnerable individuals.

Self-test:

- Can you name some of the important risk factors for anorexia and bulimia?
- Can you describe some of the biological factors that might be involved in the development of an eating disorder?
- Can you name some of the important sociocultural factors that influence the development of eating disorders? What evidence is there that these factors influence body dissatisfaction and attitudes to dieting?

Summary of psychopathology and its causes

This chapter has covered a wide range of adult psychopathologies, discussed their defining features and attempted to describe some of the contemporary theories developed to explain their aetiology. If you are reading about psychopathology for the first time, then you will probably have been struck by the fact that psychopathology can manifest itself in many different forms and have both biological and psychological causes. Our understanding of psychopathology is expanding all the time, and knowledge of the factors that cause individual psychopathologies is central to our development of effective forms of treatment. We will now discuss the types of treatments that have been developed in Chapter 34.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the characteristics and diagnostic criteria of at least three or four important psychological disorders.
2. Describe, compare and contrast at least two contemporary theories of the aetiology of (1) an anxiety disorder, (2) a depressive disorder, (3) schizophrenia, and (4) eating disorders.
3. Distinguish between biological and psychological explanations of psychological disorders.
4. Describe the relevance of a variety of research methodologies used in clinical psychology research, particularly questionnaire and experimental methodologies.
5. Describe some of the important phenomenological characteristics of a range of psychological disorders.

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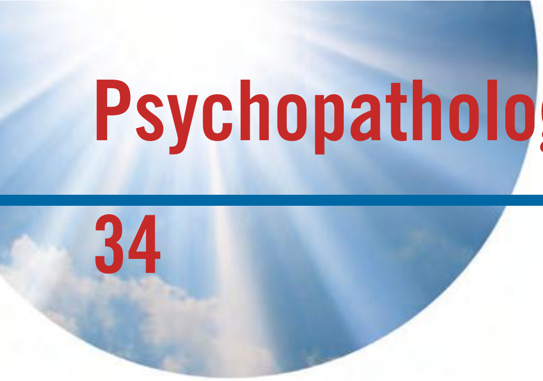

34

Treating psychopathology

Route map of the chapter

This chapter describes a broad range of therapies and treatments that has developed to treat psychopathology. The treatments discussed cover biological treatments (such as drug-based treatments) and the major psychotherapies that have been developed from a range of different theoretical perspectives (e.g. psychoanalysis, humanistic therapies, behaviour therapies and cognitive therapies). Each section introduces the reader to the main principles upon which these therapies are based. Finally, this chapter discusses methods for assessing the effectiveness of therapies.

Introduction

What is very much apparent from the previous two chapters is that psychological problems are both distressing and disruptive for the individual sufferer. Because of this, there is an immediate need to find ways to alleviate these conditions through therapy or treatment.

Those of you that have been through periods of psychological distress – whether it be an acute period of depression or anxiety – will be aware that many different kinds of things can make you feel better. Just talking to a friend or family member about the condition, trying to distract yourself (e.g. shopping therapy!), taking mild forms of medication prescribed by your GP – or simply popping bubble wrap. All these are potentially therapeutic in that they may alleviate (temporarily or permanently) the distress caused by the symptoms of the psychopathology.

This need to alleviate the distress and disruption to daily living caused by psychological problems has led to the development of a very wide range of treatments and therapies. Some have established themselves as treatments of choice for many disorders (e.g. behaviour therapy and cognitive therapy), others are based on attempting to treat physical or medical correlates of the disorder (e.g. ECT, psychosurgery), and others have stood the test of time as well-developed therapeutic paradigms still advocated by many psychotherapists (e.g. psychoanalysis). This chapter will describe some of the more important and prevalent of the treatment paradigms developed to alleviate psychological disorders and the principles on which they are based, and then finally describe how we go about effectively evaluating the success of various therapies.

Biological treatments

In Chapter 32 we discussed how some of the earliest attempts to explain psychopathology was in terms of underlying medical causes – for example, in the 19th century some forms of mental illness were traced to physical illnesses such as syphilis. Discovering that some causes of mental illness had biological or medical origins quite obviously led to attempts to explain and then treat mental illness by medical means. However, while there are some psychological disorders that do seem to have biological causes, there are very many others where a physical cause cannot easily be identified, and which appear to be caused by dysfunctional ‘ways of thinking’ rather than direct biological dysfunction (see Chapter 33). Because of this, biological therapies have developed into a mixed bag of treatments: (1) some do appear to deal with the direct causes of the disorder (e.g. pharmacological treatments for schizophrenia), (2) some provide relief from the distress and emotional discomfort caused by the disorder (e.g. antidepressant and anxiolytic drugs that provide relief from depression and anxiety), and (3) some are used because they appear to have beneficial effects on symptoms even though it is far from clear why they might have these effects (e.g. electroconvulsive therapy (ECT)).

Pharmacotherapies

One of the most important developments in the treatment of psychopathology has been the growth in our understanding of the use of drug-based treatments for a variety of important disorders. These include the use of antipsychotic drugs to treat schizophrenic symptoms, and antidepressants and anxiolytic drugs to treat mood and anxiety disorders.

TABLE 34.1 SOME REGULARLY USED DRUG MEDICATIONS FOR PSYCHOLOGICAL DISORDERS

Primary therapeutic use	Drug Class	Generic or Chemical Name	Trade Name
Antidepressants	MAO Inhibitors	Phenelzine Tranylcypromine	Nardil Parnate
	Tricyclics	Clomipramine Imipramine	Anafranil Tofanil
	Selective Serotonin Reuptake Inhibitors (SSRIs)	Fluoxetine Paroxetine Sertaline	Prozac Paxil Zoloft
Antipsychotics	Butyrophenones	Haloperidol	Haldol
	Phenothiazines	Chlorpromazine Thioradazine	Thorazine Mellaril
Anxiolytics (Anxiety-Reducing Medications)	Benzodiazepines	Alprazolam Chlordiazepoxide Diazepam Lorazepam	Xanax Librium Valium Activan

Drug treatment of schizophrenia

Drug therapies for schizophrenia have radically revolutionised the way that schizophrenia sufferers are treated and cared for. The use of effective antipsychotic drugs became common in the 1960s and 1970s, and this had the effect of drastically reducing the number of schizophrenic sufferers who need long-term institutionalised care, and has led to such sufferers reaching a level of normal functioning that permits care to take place in the community. Prior to the 1980s, it was estimated that two out of three schizophrenia sufferers would spend most of their lives in a psychiatric institution; beyond the 1980s the average length of stay is down to as little as two months (Lamb, 1984).

Antipsychotics (such as chlorpromazine and haloperidol) have their effects by blocking dopamine receptors and help to reduce the high levels of dopamine in the brains of schizophrenics (see Chapter 33). This not only reduces the major positive symptoms (such as thought disorder and hallucinations), but can also reduce the major negative symptoms (such as social withdrawal). However, while these drugs have had a remarkable effect on reducing the symptoms of schizophrenia, and, as a consequence, reducing the burden of institutionalised care for schizophrenics, there are some negative factors to consider. For example, most antipsychotics do have some undesirable side effects for some people (such as blurred vision, muscle spasms, blood disorders, cardiac problems, etc.), and these side effects can cause relapse, or make sufferers unwilling to take their medication on a regular basis (which needs constant monitoring if the individual is being cared for in the community). The fact that the success of antipsychotics has led to more sufferers being treated in the community still requires that they be properly monitored and supported in that environment, and this increases the importance of the role of the community psychiatric nurse in longer-term treatment and rehabilitation.

Drug treatment of depression

Drug treatments for depression were first successfully developed in the 1960s and the drugs that were first developed were called tricyclic antidepressants (because of their chemical structure). These drugs have their effect by increasing the amount of norepinephrine and serotonin available for synaptic transmission. Other antidepressants introduced during this period were monoamine oxidase inhibitors (MAOIs) (such as phenelzine and tranylcypromine). MAOIs are effective for some people with major depression who do not respond to other antidepressants. They are also effective for the treatment of panic disorder and bipolar depression.

Most recently, we have seen the development of the first ‘designer drugs’ for depression, and these include fluoxetine (Prozac), sertraline (Zoloft), paroxetine (Paxil), and citalopram (Celexa). These newer drugs are collectively called selective serotonin reuptake inhibitors (SSRIs), because they selectively affect the uptake of only one neurotransmitter – usually serotonin. SSRIs can reduce the symptoms of depression as rapidly as tricyclic antidepressants, and have far fewer side effects. SSRIs –

especially Prozac – have often been viewed as the miracle drug for depression. However, it too can cause some side effects (such as a loss of sexual desire in up to 30% of users – Montgomery, 1995), and is perhaps at the point where it is becoming over prescribed by GPs who are perhaps failing to look further for more structured psychological treatment for their depressed patients (Olfson and Klerman, 1993).

Drug treatment of anxiety

There are a number of psychological disorders that are characterised by chronic, high-levels of anxiety. The more prevalent of these include clinically diagnosable specific phobias, panic disorder, generalised anxiety disorder (GAD), obsessive-compulsive disorder (OCD), and post-traumatic stress disorder (PTSD). The symptoms of these disorders can usually be treated with anxiolytics (tranquillisers) such as the benzodiazepines (which include the well-known tranquilliser, valium), and they have their effect by increasing the level of the neurotransmitter GABA at synapses in the brain. Benzodiazepines are usually prescribed for only short periods because they can encourage dependence if taken over a longer period, and can also be abused if available in large doses. However, it is important to be aware that anxiolytics will usually offer only symptom relief, and do not address the psychological and cognitive factors that may be maintaining the anxiety. These latter factors can be specific to different anxiety disorders (see Chapter 35) and probably need attention through structured psychotherapy.

Electroconvulsive therapy (ECT)

There are a number of other therapies that can be considered as examples of biological treatments (others include forms of psychosurgery), but one of the most controversial is electroconvulsive therapy (ECT). ECT is where an electric current is passed very briefly (usually 0.5 seconds) between two electrodes attached to the head of the patient, and was dramatically illustrated in the film *One Flew Over the Cuckoo's Nest* starring Jack Nicholson. ECT induces a convulsive seizure similar to an epileptic fit. This treatment is still regularly practiced in psychiatric hospitals throughout the world, but only when most other forms of therapy have failed. Individuals given ECT treatment are usually severely depressed, and may have some residual schizophrenic or manic symptoms. Although its use is still controversial (Johnstone, 2003), there is some evidence that it is successful in alleviating the symptoms of depression for as many as 80% of those patients who have failed to respond to drug treatment alone (Andreasen and Black, 1996), but that this beneficial effect may be short-term and limited to as little as four weeks (Breggin, 1997), and the relapse rate is high (Royal College of Psychiatrists, 1995). However, it is still very unclear how ECT has the therapeutic effects that it does, but ECT is known to produce widespread effects on brain neurotransmitters generally, and on the secretion of hormones that may influence depressed mood. Other researchers have argued that the short-term beneficial effects of ECT are nothing more than would be expected following *any* trauma to the brain – immediate symptoms of confusion, headache and nausea followed by a period of emotional shallowness, denial and artificial euphoria that may last for a few weeks (Breggin, 1997).

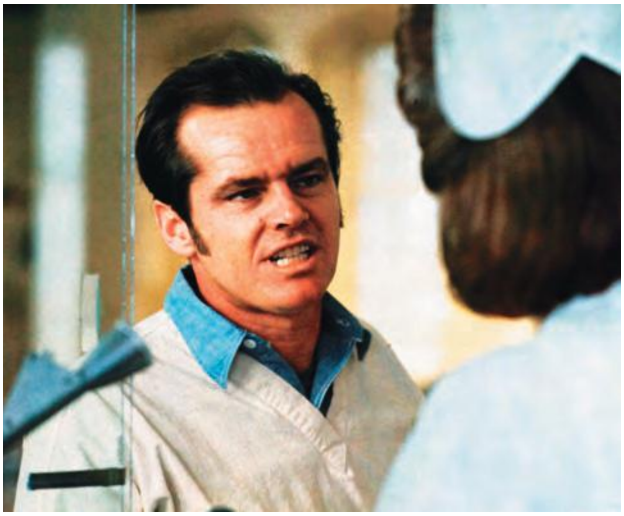

Photo 34.1 Jack Nicholson was subjected to ECT treatment in the film One Flew Over the Cuckoo's Nest.

Self-test: Name the main types of drug treatment for psychopathology.

Psychotherapies

Psychotherapy is the general term used for any form of intervention or treatment that attempts to address the psychological factors (rather than biological factors) that may be associated with a psychopathology. Many explanations of psychopathology argue that psychological problems are caused by the nature of the life experiences that an individual has, which in turn may have shaped dysfunctional 'ways of thinking' that act to maintain and foster psychological disorders, or developed inappropriate responses through unusual learning experiences. Psychotherapies usually attempt to address psychopathology by (1) providing the individual with insight into the life experiences that may have given rise to their condition (e.g. psychoanalysis), (2) dealing directly with the dysfunctional ways of thinking that are maintaining the disorder (e.g. cognitive behaviour therapy), or (3) correcting the 'faulty' learning that gave rise to inappropriate responses (e.g. behaviour therapy).

There are very many different forms of psychotherapy, some more accepted than others, and some have been developed to address very specific disorders. Not all psychotherapists have training in psychology, but many have skills in a closely related profession, such as counselling (MacRae, 2003).

Psychoanalysis

Psychoanalysis was developed by Sigmund Freud in the early part of the 20th century, and was a revolutionary way of understanding emotions and attempting to help people with their psychological problems. Central to psychoanalysis is the assumption that individuals are often unaware of the factors that contribute to their psychological condition, and that such unconscious factors may be the source of psychological conflict. These inner conflicts can then manifest themselves as recognisable psychological symptoms, troubling personality traits, difficulties in relationships, or disturbances in mood and self-esteem. Psychoanalysis uses a number of techniques to attempt to demonstrate to the individual what these unconscious factors are, what experiences in the individual's past may be responsible for them, and how the individual might deal better with these unconscious factors.

Psychoanalysis and psychopathology

Before discussing the methods that psychoanalysis uses to help alleviate psychological distress, it is useful to understand how psychoanalysis believes that psychological distress is caused. Freud's theories of personality structure and stages of development are important here (see also Chapter 2, page 10). For Freud, there were three main components to an individual's psychological make-up: (1) Freud believed all individuals are born with reflexes and instincts that are called the libido. The libido contains an energy force that drives the Id, and the Id is that part of the individual's psyche which unashamedly attempts to satisfy instinctive and biological needs; (2) As the individual child begins to develop and interact with its environment, it begins to develop a sense of self which develops into the psychic structure called the Ego. Inevitably, the functions of the Id and Ego begin to conflict and the Ego will attempt to suppress some of the needs required by the Id; (3) Finally, extensive interaction with the world enables the individual to internalise principles related to social norms and values, and this develops into the third psychic structure, the Superego. Conflict between the needs of the Id and the values inherent in the Ego and Superego eventually lead to the repression of instincts into the 'unconscious' which lead to the development of guilt, and the psychological distress associated with that. Eventually, the Ego develops defence mechanisms whose function is to deal with the conflict by keeping them in the unconscious. Such defence mechanisms include repression, denial and rationalisation.

Freud also believed that as children, individuals have to negotiate four different stages of development, and each stage centres on a different theme. These stages are the oral stage, the anal stage, the Oedipal or Electra stage, and the latency stage (see Chapter 2, page 11). If the child is able to successfully negotiate these four stages then a psychologically healthy individual results. However, if conflicts within stages are not properly resolved, then potentially problematic personality traits may develop (e.g. someone who does not properly negotiate the anal stage may develop personality characteristics such as stubbornness or obsessive orderliness).

Techniques of psychoanalysis

The aim of psychoanalysis is to bring any unconscious conflicts into awareness, to help the individual understand the source of these conflicts (perhaps by identifying past experiences or discussing the nature of important relationships), and to help the individual towards a sense of control over behaviour, feelings and attitudes. There are a number of basic techniques used by psychoanalysts to achieve these goals: (1) free association – here the client is encouraged to verbalise all thoughts, feelings and images that come to mind while the analyst is normally seated behind them, and this process functions to bring into awareness any unconscious conflicts or associations between thoughts and feelings; (2) transference – here the analyst is used as a target for emotional responses, and the client behaves or feels towards the analyst as they would have behaved towards an important person in their lives. This allows the client to achieve understanding of their feelings by acting out any feelings or neuroses that they have towards that person; (3) dream analysis – Freud believed that unconscious conflicts often revealed themselves in symbolic forms in dreams, and this made the analysis of dream content an important means of accessing unconscious beliefs and conflicts; (4) interpretation – finally, the skilled psychoanalyst has to interpret information from all of the above sources and help the client to identify important underlying conflicts and help the client develop ways of dealing with these conflicts.

An appraisal of psychoanalysis

Psychoanalysis represents a quest for self-knowledge, where an individual's problems are viewed in the context of the whole person, and in particular, any conflicts they may have repressed. As a form of treatment, psychoanalysis may take up to three to five sessions a week and change is expected to take place at a normal maturational rate, and so may require anything between three and seven years for the full therapeutic benefits of the therapy to be recognised. Other forms of psychodynamic therapy may be briefer and less intensive than psychoanalysis, and may draw on techniques from other sources, such as family therapy. Psychoanalysis represents a quest for self-knowledge, where an individual's problems are viewed in the context of the whole person, and in particular, any conflicts they may have repressed. It can be an effective treatment for many people with moderate to severe anxiety or depression-based problems – especially when other, more conventional, therapies have failed. However, therapy is not considered to be complete until all problems and conflicts have been resolved – which makes an objective evaluation of its effectiveness almost impossible to conduct (because therapy is only considered to be finished when the client is better!) Because of this, psychoanalysis has come to be considered more of a process of self-understanding than as a form of treatment for specific psychological disorders.

Humanistic therapies

Throughout the twentieth century, many psychotherapists felt that psychological therapy was becoming too focused on psychological and behavioural mechanisms, or on psychological structures (such as personality), and was losing sight of the both the feelings of the individual and the individual themselves. As a consequence, a number of what are called 'humanistic' therapies developed, and the most prominent of these are client-centred therapy (Rogers, 1961) and Gestalt therapy (Perls, 1969). These therapies had a number of factors in common: (1) they were holistic therapies, in that they emphasised the need to consider the 'whole' person, and not just those 'bits' of the person that manifest psychopathology; (2) therapy should be seen as a way of enabling the individual to make their own decisions and to solve their own problems rather than imposing structured treatments or ways of thinking on the individual; (3) humanistic therapies espouse the need for the therapist-client relationship to be a genuine reciprocal and empathetic one, rather than the limited skilled professional-referred client relationship that exists in many forms of psychological therapy; and (4) increasing emotional awareness is a critical factor in alleviating psychological distress, and is necessary before the client can begin to resolve life problems.

There are an ever-growing number of psychotherapies that espouse these basic principles (existential therapies, primal therapy, narrative therapy, transpersonal therapy), but space permits that we can discuss only one in detail here.

FOCUS POINT 34.1

When to use brief humanistic and existential therapies

Humanistic and existential therapies can be useful at all stages of recovery in creating a foundation of respect for clients and mutual acceptance of the significance of their experiences.

Client-centred therapy, for example, can be used immediately to establish rapport and to clarify issues throughout the session.

Existential therapy can be used most effectively when a client is able to access emotional experiences or when obstacles must be overcome to facilitate a client's entry into or continuation of recovery (e.g. to get someone who insists on remaining helpless to accept responsibility).

Narrative therapy may be used to help the client conceptualise treatment as an opportunity to assume authorship and begin a 'new chapter' in life.

Gestalt approaches can also be used throughout therapy to facilitate a genuine encounter with the therapist and the client's own experience.

Transpersonal therapy can enhance spiritual development by focusing on the intangible aspects of human experience and awareness of unrealised spiritual capacity. These approaches increase self-awareness, which promotes self-esteem and allows for more client responsibility, thus giving the client a sense of control and the opportunity to make choices.

Source: http://www.aa2.org/philosophy/briefxistential.htm

Client-centred therapy

Most humanistic therapies focus on the individual's immediate conscious experience, and client-centred therapy is no exception. Crucial to client-centred therapy is the creation of a therapeutic climate that allows the client to progress from a state of rigid self-perception to one which encourages the client to become independent, self-directed, and to pursue self-growth. For Carl Rogers (1902–87), empathy ('putting yourself in someone else's shoes') was the central important feature of any therapist–client relationship, and it is this ability that is essential in guiding the client towards resolving their own life problems. Empathy has at least two main components in this context: (1) an ability to understand and experience the client's own feelings and personal meanings; and (2) a willingness to demonstrate unconditional positive regard for the client. This latter feature involves valuing the client for who they are and refraining from judging them. Another important feature of client-centred therapy is that it is not directive. The therapist acts primarily as an understanding listener who assists the client by offering advice only when asked. The over-riding goal is to develop the client through empathy, congruence and unconditional positive regard to a point where they are successful in experiencing and accepting themselves, and are able to resolve their own conflicts and difficulties.

In much the same way that psychoanalysis has evolved, client-centred therapy has developed not just as a therapy, but also as a process for fostering personal self-growth. The general approach places relatively little emphasis on how the psychopathology was acquired, but attempts to eliminate symptoms by moving the client from one phenomenological state (e.g. a state of anxiety, depression, etc.) to another (e.g. one that enables the client to view themselves as worthy and respected individuals).

Behaviour therapies

In the 1940s and 1950s there was a growing dissatisfaction with the medical or disease model of psychopathology, and also with the unscientific approaches to psychopathology being generated by many psychodynamic theories. These dissatisfactions led psychologists to look towards the developing area of experimental psychology for objective knowledge that might be used to inform treatment and therapy. The body of knowledge that psychologists turned to was that of conditioning (see Chapter 8), and this gave rise to the development of what came to be known as behaviour therapies. First, such therapies stressed the need to treat symptoms of psychopathology as *bona fide* behavioural problems rather than the mere symptoms of some other, hidden underlying cause. Second, at the time, many psychologists believed that numerous psychological disorders were the result of what was called faulty learning, and that symptoms were acquired through simple conditioning processes. For example, it was believed that anxiety symptoms could be acquired through classical conditioning – e.g. a phobia might be acquired through the pairing of the phobic stimulus with a traumatic event (Watson and Rayner, 1920) (see Figure 33.1), and behavioural problems might be acquired through processes of operant conditioning – e.g. bizarre and inappropriate behaviours might be acquired because they have been reinforced or rewarded in the past (see Chapter 32, Focus point 32.1). The reasoning here was that if psychological problems were acquired through learning, then we could use conditioning principles to develop therapies that effectively helped the individual to 'unlearn' those problematic associations. Two distinctive strands of behaviour therapy developed from these assumptions. The first was a set of therapies based on the principles of classical conditioning, and the second based on principles of operant conditioning. While the former group of therapies continues to be known as behaviour therapy, the latter group has also come to be known as behaviour modification or behaviour analysis.

Therapies based on classical conditioning principles

Behaviour therapy effectively originates from the writings of Wolpe (1958) – who argued that many forms of emotional disorder could be treated using the classical conditioning principle of extinction. The assumption was that if emotional problems such as anxiety disorders were learned through classical conditioning, they could be 'unlearned' by disrupting the association between the anxiety provoking cues or situations and the threat or traumatic outcomes that they have become associated with (see Chapter 8 for details of extinction procedures). In practice, this means ensuring that the anxiety-provoking stimulus, event or situation (the conditioned stimulus, CS) is experienced in the absence of accompanying trauma (the unconditioned stimulus, UCS) so that the former no longer comes to evoke the latter. The most famous behaviour therapy techniques to apply extinction principles are flooding, counterconditioning and systematic desensitisation, and they have collectively come to be known as exposure therapies, because they are all based on the need to expose the client to the events and situations that evoke their distress and anxiety – so that they can learn that they are no longer threatening. Wolpe (1958) also introduced the principle of reciprocal inhibition, in which an emotional response is eliminated not just by extinguishing the relationship between the CS and the UCS, but also by attaching a response to the CS which in incompatible with anxiety (e.g. relaxation). It has often been assumed that these techniques can only be applied to the treatment of emotional problems such as anxiety disorders, but they have in fact been applied to a range of disorders including addictive disorders (O'Leary and Wilson, 1975), marital conflict (Jacobson and Weiss, 1978), and sexual dysfunction (Mathews et al., 1976).

Flooding

This is an extinction-based therapy that involves therapist-led prolonged exposure to the emotionally provoking event or situation. Flooding can be conducted *in vivo* (through direct exposure to the anxiety-provoking events or stimuli) or *in vitro*, by asking the individual to imagine extended contact with these events and stimuli. Exposure to the anxiety-provoking event or situation needs to be prolonged and therapist led (to avoid excessive distress on first confronting these events and situations) – brief exposures can actually make the anxiety worse! So curing your sibling of spider phobia won't be achieved by the abrupt action of putting a spider in their clothing – exposure needs to be structured and prolonged (usually at least 30 minutes or more per structured exposure session).

Counterconditioning

This is a technique also based on extinction, but where the therapist attempts to attach a response to the anxiety-provoking events and situations that is inconsistent with anxiety. Usually, the counterconditioned response is some form of relaxation – people cannot be both anxious and relaxed at the same time.

Systematic desensitisation

This is arguably the most effective, widely used and successful of the behaviour therapies based on classical conditioning, and it is still used today as a treatment of choice for many anxiety-based problems (especially phobias). In systematic desensitisation, the therapist helps the client to construct a ranked list of events that cause increasing fear or anxiety (known as the fear hierarchy). The client is then trained in the use of relaxation techniques. Therapy proceeds as the individual is exposed to the anxiety-provoking situation at the bottom of the hierarchy and learns to relax in that situation. Once the client feels quite relaxed with this, therapy then moves on to relaxation in the presence of the next highest ranked situation on the fear hierarchy. Thus, the technique involves extinction of

ACTIVITY BOX 34.1

Creating a fear hierarchy for one of your own fears or phobias

The following provides a step-by-step example of how to create a fear hierarchy. Read through this example – related to fear of flying – and then use these steps to create a fear hierarchy for one of your own fears or phobias.

Overview

The fear hierarchy will contain situations or scenes involving some aspect of making a flight. These situations most likely will be situations you have actually experienced, but they can also be situations that you fear experiencing even though they have never actually happened to you. For example, you may want to include the item 'The airplane has to turn around and return to the airport in an emergency' even though this has never actually happened to you. The important point is that items included in an anxiety hierarchy describe situations which produce varying levels of anxiety, some more worrisome than others—this is what hierarchy means, and the details of this will be presented below.

You should describe the items on your anxiety hierarchy in sufficient detail to enable you to vividly imagine each one. It might be sufficient to say, 'Standing in line at the ticket counter,' but saying, 'Standing in a long line at the crowded ticket counter, with nothing to do but wait to get my luggage checked,' might be more graphic. Remember that items are most effective if they can help you experience the event in your imagination, not just describe it.

Creating your anxiety hierarchy

You should attempt to create about 16 or 17 situations at the beginning. Most people tend to discard some items in the sorting process, so you can expect to end up with about 10 to 15 items in your final hierarchy. To aid in sorting the items, write each one on a separate index card.

As was mentioned earlier, the situations or scenes in your hierarchy should represent a fairly well-spaced progression of anxiety. The best way to achieve this goal is to first grade the anxiety of each item by assigning it a number on a scale from 0 to 100, where 100 is the highest level of anxiety imaginable and 0 is no anxiety (complete relaxation). Write this number on the back of the index card for the item being graded. At this point, you need not worry about how well-spaced the items are; just give each item the first number grade that 'pops into your head.'

When each item has an anxiety grade, your next step will be to sort the cards into 5 piles. Each pile will represent a different category of anxiety, as follows:

Pile	Anxiety grade
Low Anxiety	1–19
Medium Low Anxiety	20–39
Medium Anxiety	40–59
Medium High Anxiety	60–79
High Anxiety	80–100

The goal here is to end up with at least two items in each pile. If this happens, congratulations. If not, you will have to go back and re-evaluate some items or create some new items. When you have finished, combine all the cards into one pile that is ordered from lowest to highest anxiety. This is your personal Fear of Flying anxiety hierarchy. Set the cards aside for one day.

It helps to check the accuracy of your ordering by shuffling the cards the next day or so. Without looking at the grades on the back of the cards, re-order them. Then check the grades to see if your second ordering is the same as the first. If not, make some adjustments. You don't have to waste a lot of time with this; just try to get an order that feels right and that represents a fairly smooth progression from low to high anxiety.

Sample fear of flying anxiety hierarchy

The following is a sample hierarchy to help you develop your own hierarchy. Your items should, of course, be more fully detailed. Also note that any item's relative anxiety level does not necessarily relate to its temporal sequence.

- Packing luggage
- Making reservations
- Driving to the airport
- Realising you have to make a flight
- Checking in
- Boarding the plane
- Waiting for boarding
- Taxiing
- In-flight service
- Moving around the cabin
- Climbing to crusing altitude
- Descending
- Waiting for departure
- Taking off
- Landing
- Turbulence

Source:
http://www.guidetopsychology.com/sysden.htm

anxiety through graduated exposure, and counterconditioning of a relaxation response that is incompatible with anxiety. The success of systematic desensitisation has been shown to be dependent on the principles of extinction and exposure (Kazdin and Wilcoxon, 1976), and has also been shown to be more effective than both no treatment conditions and almost every other type of psychotherapy with which it has been compared (Rachman and Wilson, 1980).

Aversion therapy

This is rather different to the preceding therapies because aversion therapy attempts to condition an aversion to a stimulus or event to which the individual is inappropriately attracted. For example, aversion therapy is most widely used in the treatment of addictive behaviours such as alcoholism, and in these procedures the taste of alcohol is paired with aversive outcomes (e.g. sickness inducing drugs) in order to condition an aversive reaction to alcohol (e.g. Voegtlin and Lemere, 1942; Lemere and Voegtlin, 1950). Since the 1950s and 1960s, this type of procedure has been used to treat a wide variety of problems, including inappropriate or distressing sexual activities (e.g. Feldman and MacCulloch, 1965), drug and alcohol addiction (McRae, Budney and Brady, 2003), and even obsessions and compulsions associated with anxiety (Lam and Steketee, 2001). Aversion therapy was popularised in the 1971 cult film ‘A Clockwork Orange’ where the lead character’s excessive violence was treated by ‘conditioning’ him to vomit whenever he saw a violent act. However, while aversion therapy for some problems (e.g. alcoholism) has been shown to have some therapeutic gains when used in conjunction with broader community support programmes (Azrin, 1976), addictive responses are often very resistant to this form of treatment, and there is very little evidence that aversion therapy alone has anything other than short-lived effects (e.g. Wilson, 1978).

Therapies based on operant conditioning principles

The principles of operant conditioning offer some rather different approaches to treatment and therapy than do those of classical conditioning. Operant conditioning is concerned with influencing the frequency of a behaviour by manipulating the consequences of that behaviour. For example, if a behaviour is followed by rewarding or reinforcing consequences, it will *increase* in frequency. If it is followed by punishing or negative consequences, it will *decrease* in frequency (see Chapter 8). Operant conditioning principles have mainly been used in therapy in three specific ways: (1) to try to understand what rewarding or reinforcing factors might be maintaining an inappropriate or maladaptive behaviour – this is known as functional analysis (e.g. trying to understand what factors might be maintaining challenging or aggressive behaviours in individuals with severe learning difficulties), (2) to use reinforcers and rewards to try to establish new or appropriate behaviours (e.g. to establish self-help or social behaviours in individuals who have become withdrawn because of their psychopathology), and (3) to use negative or punishing consequences to try to suppress or eliminate problematic behaviours in need of urgent attention (e.g. to eliminate or suppress self-injurious behaviours in individuals with serious learning difficulties).

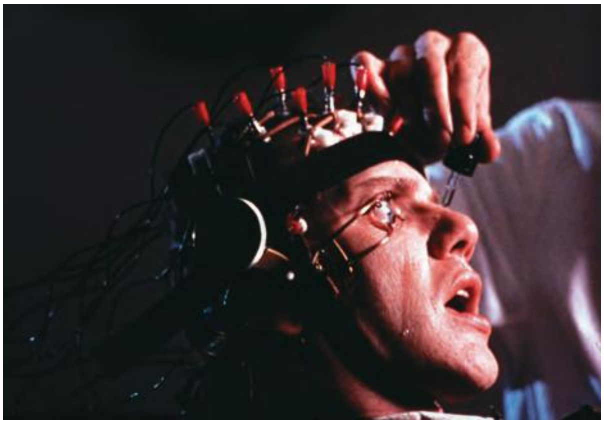

Photo 34.2 Alex, the leading character in the 1971 film *A Clockwork Orange*, undergoes aversion therapy to cure his violent tendencies.

Functional analysis

This is where the therapist attempts to identify consistencies between problematic behaviours and their consequences – especially to try to discover whether there might be a consistent event or consequence that appears to be maintaining the behaviour by rewarding it. For example, self-injurious or challenging behaviours may be maintained by a range of reinforcing consequences, such as the attention the behaviour may attract or the sensory stimulation it provides. Identifying the nature of the consequence allows the therapist to disrupt the reinforcement contingency and, if necessary, reduce the frequency of that behaviour through extinction (Mazaleski et al., 1993; Wacker et al., 1990) (see Focus Point 34.2). Functional analysis has been adopted across a range of clinical settings, and has been successfully applied to controlling aggressive/challenging behaviour (O’Reilly, 1995), tantrums (Darby et al., 1992), ADHD (Northrup et al., 1995), depression (Ferster, 1985), anorexia nervosa (Slade, 1982), and self-injurious behaviour (Iwata et al., 1985).

Token economy schemes

One of the enduring advantages of operant reinforcement is that it can be readily and easily adapted to group therapy and group management schemes, and the first systematic group management procedure in therapeutic use was the token economy (Ayllon and Azrin, 1968). In the psychiatric setting, a token economy involves participants receiving tokens (a generalised reinforcer) for engaging in behaviours defined by the programme, and at a later time, these tokens

FOCUS POINT 34.2

A functional analysis of challenging behaviour

Some individuals with intellectual disabilities typically display behaviour that may put themselves or others at risk, or which may prevent the use of community facilities or prevent the individual having a normal home life. ***Challenging behaviours*** may take the form of aggression, self injury, stereotyped behaviour, or disruptive and destructive behaviour generally. In many cases, a ***functional analysis*** may help to identify the factors maintaining challenging behaviour, and these may range from social attention, tangible rewards such as a hug, escape from stressful situations, or they may simply provide sensory stimulation. A functional analysis is undertaken by keeping a record of the frequency of the behaviours and noting the antecedents and consequences of the behaviour. This will take the form of:

A What happens before the challenging behaviour (the trigger)
B What does the individual do? (the behaviour)
C What does the person get as a result of the behaviour? (the consequence)

A typical 'ABC' chart on which family and carers will keep a record of these behaviours will often look like this:

A functional analysis case history

Andy is a middle-aged man with severe intellectual disability. He has recently moved into a group home where he shares with seven other people. Since he moved in, staff have observed several incidents of self-injury. They report that Andy starts to rock backwards and forwards in his chair, and this then escalates into him slapping his face repeatedly. Staff have asked for help.

The staff team working with Andy were asked to complete ABC charts for four weeks. These were then analysed and it was found that the behaviour tended to occur in the lounge when there were a number of people in the room and the television was on. The consequence of Andy starting to rock and slap himself was that staff would remove him from the room and take him into the kitchen where it was empty and quiet.

It was hypothesised that the function of the behaviour for Andy was to escape from a noisy and crowded situation. Staff decided to respond by watching Andy for early signs he may be feeling overstimulated and to ask him if he wanted to leave the room.

This led to a reduction of self-injury and later it was noted that Andy would now try to attract staff attention when he wanted to leave.

(Source: Davey, 2008)

Date	Antecedent (what happened before the behaviour occurred?)	Behaviour (describe exactly what the person did)	Consequence (what happened immediately after the behaviour?)	Signature

can then be exchanged for a variety of reinforcing or desired items (e.g. access to the hospital grounds, a visit to the cinema). In psychiatric care, the token economy was first used to foster prosocial or self-help behaviours (e.g. combing hair, bathing, brushing teeth) in previously withdrawn patients. Programmes such as this help to establish behaviours that encourage socialisation in withdrawn individuals, and foster behaviours that are likely to be required in life outside of the psychiatric institution. A number of studies have indicated that token economies can have significant therapeutic gains, and patients involved in such schemes earn discharge from the institution sooner than patients not on such a scheme (Hofmeister et al., 1979; Paul and Lentz, 1997). However, despite their positive effects, the use of token economies in clinical settings is in sharp decline because of a wide variety of factors that are discussed more fully in Focus point 34.3.

FOCUS POINT 34.3

The decline of the token economy

Despite its apparent therapeutic advantages, recent surveys indicate that the use of token economies in clinical settings is in serious decline (Corrigan, 1995; Hall and Baker, 1973; Boudewyns, Fry and Nightengale, 1986). A number of reasons have been put forward for this decline.

- There are legal and ethical issues that need to be considered. This is especially so when decisions have to be made about who will participate in token economies, for how long, and what will be made available as positive reinforcers. Legislation over the past 25 years has sought to protect patients' rights, and treatment staff are severely constrained with regard to the use of more basic items as reinforcers (Glynn, 1990) – especially when patients now have a legal right to their own personal property, humane treatment including comfortable bed, chair, bedside table, nutritious meals, cheerful furnishings, etc.
- One of the major challenges for token economies has been maintenance and generalisation of therapeutic effects. To the extent that patients can obtain reinforcers outside the program and avoid punishment by exiting from the program, the therapeutic benefit of token economies becomes less useful (Glynn, 1990). It is true that some studies have shown that behaviours targeted for improvement in a token economy scheme return to low baseline levels outside of the program (e.g. Ayllon and Azrin, 1968; Walker and Buckley, 1968). However, there are other studies that have shown positive effects of maintenance and generalisation (Banzett, Liberman and Moore, 1984). Nevertheless, it should be pointed out that generalisation is not a passive process, and clinicians must actively build into the program strategies that transfer positive effects to settings outside the treatment scheme (Stokes and Baer, 1977; Stokes and Osnes, 1988).
- Some other proponents of the token economy have argued that its decline has been the result of unfounded misconceptions about the nature and efficacy of such programs (e.g. Corrigan, 1995). These include such misconceptions as token economies not being therapeutically effective, their benefits do not generalise, they do not provide individualised treatment, they are abusive and cohersive, and they are not practical to implement in the context of present-day attempts to treat patients in the community. Corrigan (1995) argues that these are all unfounded, and that the token economy remains an important and valuable tool for the management of patients and staff in treatment settings.

Source: Davey G.C.L. (1998) Learning theory, in C. E. Walker (ed.) *Comprehensive clinical psychology: Foundations of clinical psychology*. Vol. 1, pages 391–421. Copyright Elsevier 1998.

Response shaping

Behaviours can only be reinforced after they have been performed, so this makes it quite difficult to encourage new behaviours that are not already occurring at a reasonable frequency. This may be especially a problem with withdrawn individuals or individuals with restricted behavioural repertoires (such as those with severe learning difficulties). However, the technique of response shaping by successive approximations is a way around this problem. Here, the therapist will first reinforce a behaviour that does occur quite frequently and is an approximation to the specific target response. Once this general response is established, reinforcement is given only for closer and closer approximations to the target response. An early study by Isaacs, Thomas and Goldiamond (1960) demonstrates this method. They attempted to reinstate verbal behaviour in a psychiatric in-patient who had been mute for 19 years. In this example, the target behaviour is talking, but the researchers might well be waiting many years before the patient makes any verbal response that could be reinforced. However, they broke down the target behaviour so that it could be achieved by reinforcing a series of approximations to verbal behaviour (using chewing gum as a reward). They started by rewarding the patient for moving his eyes towards the gum, then for moving his mouth and lips. When this was established, they rewarded him only for making audible sounds, and in the next stage the experimenters repeatedly asked him to 'say gum'. After six weeks of regular sessions, the patient then spontaneously said 'gum please!', and this subsequently led on to the patient verbally responding to questions from the researchers.

Behavioural self-control

The use of operant conditioning principles for behaviour change purposes does not have to be overseen or administered by a therapist. The principles are quite clear and can be used by any individual to control and manage their own behaviour. This personal use of operant conditioning principles has come to be known as behavioural self-control (e.g. Thoresen and Mahoney, 1974), and has since been developed into multi-faceted behavioural programmes to deal with a variety of personal problems which include addiction, habits, obsessions, and

APPLICATIONS BOX 34.1

Developing your own behavioural-self control programme: promoting studying behaviour

How often do you sit down to write an essay or a lab report or do some reading for a seminar, only for your attention to begin to wander almost immediately? After just a few minutes, you are up making a cup of coffee to distract yourself from the difficulty of concentrating on the task in hand.

Below are some examples of how you might apply behavioural self-control principles to help you concentrate more easily when you are studying. All of these principles are based on operant or classical conditioning. When you have read these principles, sit down and write a behavioural self-control programme for your own studying behaviour that takes into account your own learning environment and your personal circumstances.

Reinforcement/punishment: always try to find some way of rewarding yourself whenever you have achieved a study goal, and make sure that you take this reward immediately on completion of the task. It may be something as simple as a refreshing cup of coffee, a chat with friends, trip to the cinema, or just listening to your favourite music CD.

Response-reinforcer contiguity/contingency: while many people claim to be aware of the principle of operant reinforcement, most rarely apply it consistently. For instance, you may decide to spend two hours in the library writing an essay and then reward yourself for this effort by going and having a coffee and a chat with friends. However, you may find that you are working so well that you continue writing until your concentration and motivation begins to wane – then you go off for coffee. With all the good intentions in the world, what has happened is that you have inadvertently reinforced behaviours consistent with falling levels of concentration and motivation rather than the two hours focused work that preceded this. Always ensure that the things you like doing (i.e. rewards) occur *immediately after* the behaviour you want to foster (i.e. concentrating).

Stimulus control (environmental planning): if you study in an environment that also controls other behaviours, then you will inevitably find it difficult to concentrate solely on studying. For example, if you try to write an essay in your kitchen, that could be very difficult, because a kitchen will also have come to elicit other competing behaviours such as eating, putting on the kettle, etc. To study effectively, you need to do this in an environment that does not control alternatives to studying (e.g. a library is a good example).

Response shaping and the setting of attainable targets: all behavioural programmes set attainment targets of some kind, and it is extremely important that any sub-goals in the program are attainable. For example, if studying you must set yourself a goal that you are certain you can achieve (e.g. reading a textbook for 15 minutes rather than 6 hours!). It is critical that goals are attainable: if they are not met because they are over-ambitious, then this is tantamount to punishing the effort that was expended in attempting to meet the goal.

Response discrimination/feedback: can you recall accurately how many hours you have spent studying in the last week? Probably not, and this is because most people have poor recall of the frequency of behaviours they are trying to develop or reinforce. This being the case, it is perhaps not surprising that you may have difficulty controlling your studying – because you are unable to accurately discriminate it or to remember it. One way in which this can be overcome is by including in the programme a period of self-observation, where the you record or chart information relevant to studying behaviour (e.g. how many hours you studied each day, what you achieved, and where you studied). This will give you an idea of the baseline frequency with which you study and will allow you to set some future goals that can increase this baseline level.

other behavioural problems (Lutzker and Martin, 1981; Stuart and Davis, 1972). A programme developed by Stuart (1967) provides a good example of a multi-faceted behavioural self-control scheme designed to address obesity by controlling behaviours contributing to over-eating. The main elements of this programme were (1) recording the time and quantity of food consumption (self-observation), (2) weighing in before each meal and before bedtime (helping the individual to discriminate how eating might have contributed to weight gain), (3) removal of food from all places in the house except the kitchen (so that only the kitchen comes to act as a cue for eating), (4) pairing eating with no other activity that might make eating enjoyable, and so reinforce it (e.g. eating should *not* occur while watching an enjoyable TV programme), (5) setting a weight loss goal of 1–2 pounds/week (setting clearly attainable goals), (6) slowing down the pace of eating (defining appropriate responses), and (7) substituting other activities for between-meal eating (programming acceptable competing responses). These principles are relatively easy to apply to your own behaviour, and Applications Box 34.1 provides some suggestions as to how you might develop your own behavioural self-control programme to promote an activity such as studying.

Cognitive therapy

Over the latter part of the twentieth century, one of the most impressive developments in our understanding of psychopathology has been our evolving insight into the cognitive factors that play important roles in causing and maintaining psychopathology. For example, some psychopathologies are caused by dysfunctional 'ways of thinking' – either about the self or the world (e.g. in major depression). In other cases, psychopathologies are characterised by dysfunctional ways of processing and interpreting incoming information. For example, many anxiety disorders are characterised by a bias towards processing threatening or anxiety-relevant information (e.g. generalised anxiety disorder) or to interpreting ambiguous information negatively (e.g. panic disorder). In both cases these biases act to develop and maintain anxiety. If such cognitive factors are maintaining psychopathology, then developing treatments that try to address and change these dysfunctional cognitive features is important.

Early examples of cognitive therapy

Ellis's Rational-Emotive Therapy (RET)

How people construe themselves, their life and the world is likely to be a major determinant of their feelings, and Albert Ellis developed one of the first cognitive therapies to address these factors (Ellis, 1962). In particular, Ellis believed that people carry around with them a set of implicit assumptions which determines how they judge themselves and others, and that many of these implicit assumptions may be irrational and cause emotional distress. For example, two irrational beliefs include (1) demanding perfection from oneself and from others, and (2) expecting approval from others for everything one does. Clearly, there will be many occasions when these goals are not met, and this will cause anxiety, depression and emotional discomfort.

Rational-Emotive Therapy (RET) attempts to challenge these irrational beliefs and to persuade the individual to set more attainable life goals. As such, RET is a good example of a group of therapies which attempt to change a set of core beliefs about the world which may be dysfunctional (i.e. either fallacious, or are a source of conflict and emotional distress). However, make no mistake about it, changing an individual's core beliefs – which have been developed and refined over a period of many years – is no easy thing. This is why highly structured cognitive therapies are required for successful treatment, and these therapies will normally go through a process of challenging existing dysfunctional beliefs, replacing these with more rational beliefs, and then getting the individual to test out this new set of beliefs in structured behavioural exercises.

Beck's cognitive therapy

Aaron Beck's cognitive theory of depression is outlined in detail in Chapter 33, and from this theory he developed a cognitive therapy for depression (Beck, 1967). Beck argues that depression results when the individual develops a set of cognitive schemas (or beliefs) which bias the individual towards negative interpretations of the self, the world and the future, and any therapy for depression must therefore address these schemas, deconstruct them and replace them with more rational schemas which do not always lead to negative interpretations. Beck's cognitive therapy does this by engaging the depressed individual in an objective assessment of their beliefs, and requires them to provide evidence for their biased views of the world. This enables the individual to perceive their existing schemas as biased, irrational and overgeneralised.

There is accumulating evidence that Beck's cognitive therapy is effective for a range of disorders and not just depression. These include panic disorder, generalised anxiety disorder, social phobia, chronic pain, irritable bowel syndrome, and bulimia nervosa (Chambless et al., 1996). Evidence is also available which suggests that when cognitive therapy is effective, it is so because it changes the individual's cognitions and beliefs (Hollon et al., 1996).

Contemporary cognitive therapies

Out of these early pioneering cognitive therapies developed what is now known as cognitive behaviour therapy (CBT), which is an intervention for changing both thoughts and behaviour, and represents an umbrella term for many different therapies that share the common aim of changing both cognitions and behaviour. A CBT intervention usually possesses most of the following characteristics: (1) the client is encouraged to keep a diary noting the occurrence of significant events and associated feelings, moods, and thoughts in order to demonstrate how events, moods and thoughts might be interlinked, (2) with the help of the therapist, the client is urged to identify and challenge irrational, dysfunctional or biased thoughts or assumptions, (3) clients are given homework in the form of 'behavioural experiments' to test whether their thoughts and assumptions are accurate and rational, and (4) clients are trained in new ways of thinking, behaving and reacting in situations that may evoke their psychopathology.

CBT is generally perceived as an evidence-based and cost-effective form of treatment that can be successfully applied to a very broad range of psychopathologies (Butler, Chapman, Forman and Beck, 2006), and Table 34.2 gives some examples of how a cognitive therapist would approach the treatment of panic disorder. This example,

TABLE 34.2 COGNITIVE THERAPY FOR PANIC DISORDER

The following transcript gives an example of how a cognitive therapist (T) would try to challenge the catastrophic beliefs of a panic disorder sufferer (P) who believes that signs of an impending panic attack are signals for an imminent heart attack.

P: When I'm panicking, it's terrible I can feel my heart pounding; it's so bad I think it could burst through my chest.
T: What thoughts go through your mind when your heart is pounding like that?
P: Well I'll tell you what I think; it's so bad that I think I'm going to have a heart attack. It can't be good for your heart beating like that.
T: So you're concerned that anxiety can damage your heart or cause a heart attack.
P: Yes, it must do you some damage. You hear of people dropping down dead from heart attacks caused by stress.
T: Do you think more people have stress in their lives than die of heart attacks?
P: Yes, I suppose so.
T: How can that be if stress causes heart attacks?
P: Well, I suppose it doesn't always cause problems. Maybe it does only in some people.
T: Yes, that's right; stress can cause some problems in some people. It tends to be people who have something wrong with their hearts in the first place. But stress is not necessarily the same as sudden anxiety or panic. When you panic your body releases adrenalin which causes the heart to speed up and your body to work faster. It's a way of preparing you to deal better with danger. If adrenalin damaged the heart or body, how would people have evolved from dangerous primitive times? Wouldn't we all have been wiped out?
P: Yes, I suppose so.
T: So maybe panic itself doesn't cause heart attacks, there has to be something physically wrong for that to happen. When people have had heart attacks they are often given an injection of adrenalin directly into the heart in order to help start it again. Do you think they would do that if it damaged the heart even more?
P: No I'm sure they wouldn't.
T: So, how much do you now believe that anxiety and panic will damage your heart?

Source: Wells, A. (1997) *Cognitive Therapy of Anxiety Disorders*. Chichester: Wiley, pp. 123–124. Copyright 1997. Copyright John Wiley & Sons Limited. Reproduced with permission.

taken from Adrian Wells' book *Cognitive Therapy of Anxiety Disorders*, shows how the therapist attempts to challenge the client's catastrophic interpretation of their symptoms and bodily sensations, and then tries to provide counter-evidence about the causes and meaning of bodily sensations.

Group therapies

Therapy can also be undertaken in a group and not just on a one-to-one therapist-client basis. Group therapy can be useful (1) when a group of individuals share similar problems or psychopathologies (e.g. self-help groups), or (2) when there is a need to treat an individual in the presence of others who might have a role in influencing the psychopathology (e.g. family therapy). Group therapies can have a number of advantages, especially when individuals (1) may need to work out their problems in the presence of others (e.g. in the case of emotional problems relating to relationships, feelings of isolation, loneliness and rejection), (2) may need comfort and support from others, and (3) may acquire therapeutic benefit from observing and watching others. There are now many different types of group therapy (Bloch and Crouch, 1987), and these include *experiential groups* and *encounter groups* (which encourage therapy and self-growth through disclosure and interaction) and *self-help groups* (which bring together people who share a common problem, in an attempt to share information and help and support each other – e.g. Alcoholics Anonymous).

Family therapy is a specific form of group therapy that is becoming increasingly helpful as a means of dealing with psychopathology that may result from the relationship dynamics within the family (Dallos and Draper, 2002). Family therapy has a number of purposes: (1) it helps to improve communications between members of the family – especially where communication between individuals might be the cause of psychopathology in one or more family members; (2) it can resolve specific conflicts – for example between adolescents and their parents; and (3) it may apply systems theory (attempting to understand the family as a social system) to treatment by trying to understand the complex relationships and alliances that exist between family members, and then attempting to remould these relationships into those expected in a well-functioning family. In family therapy, the therapist or family therapy team meets with those members of the family willing to participate in discussion about a topic or problem raised by one or more members of the family. In the case of an adolescent eating disorder, the parents may have raised the issue of how their child's eating disorder affects family functioning, and this may be explored with the family over

FOCUS POINT 34.4

A family therapy case history: the Sinclair family

Sandy, aged 17, had been suffering with anorexia for over two years of such severity as to require two brief stays in hospital. She was living with her parents and older brother. Two older brothers had left home.

Though all were invited only Sandy and her parents attended for family therapy which took place at intervals of 3 to 4 weeks over 18 months. The sessions, with the full permission of all of the family were of one-hour length with the therapist in the room with them and a team observing from behind a one-way mirror. The team usually joined the family and the therapist after 40–50 minutes and held a reflective discussion with each other in front of the family in which they shared their ideas about the family's problems, ideas, understandings and feelings. The family were then invited to comment and then held a closing discussion with the therapist when the team had left the room. The core idea of family therapy is that problems such as anorexia are not simply, or predominantly individual but are related to wider stresses and distress the family are experiencing. In addition it is recognised that the sense of failure and blame associated with conditions such as anorexia can paralyse families' abilities to help each other.

Initially each member of the family was asked to describe what they saw as the main problems and invited to offer their explanations of the causes of the problem.

This was followed by a focus on two broad areas: a). The impact of the problems on each of them and their relationships with each other, and, in turn b). The influence that they could exert on the nature of the problems. Initially the parents indicated that the distress caused by Sandy's anorexia was the main problem for all of them. However, it quickly emerged that the parents had very different ideas about what caused the problems and what to do to help. Mr Sinclair had a medical and practical view and Mrs Sinclair a more relational and emotional one. Through the use of a genogram (family tree) it was revealed that both parents had themselves had very negative experiences of being parented that made it hard for them to know how to comfort and help their children. It also transpired that their marriage was in serious difficulty. Sandy commented that her parents' conflicts upset her and she felt caught in the middle in trying to meet the emotional needs of both of her lonely parents. In effect she felt like she was a therapist for her own family (interestingly, she has gone on to study psychology at university).

The therapist and the reflecting team discussed the possible impacts that the parents' own experiences may have played on how they acted towards Sandy. Along with this there were discussions of a variety of related issues, such as the pressure on young women to confirm to stereotypes of thinness and starving as an attempt to exert control in one's life. Some marital work was done separately with the parents to look at their childhoods, their marriage, their own needs and how these impacted on Sandy. Mrs Sinclair in particular felt she had failed as a mother but was relieved to hear that the team did not see it in this way. Sandy gained considerable insight into how the family dynamics across the generations had impacted on her and her parents. She became independent enough to go to University but initially struggled, as did her parents to separate. Some struggle with her weight continues but she is confident that she will cope in the long-term.

Case history provided by Dr Rudi Dallos, Consultant Clinical Psychologist (Somerset Partnership Trust) and Director of Research, Clinical Psychology Teaching Unit, University of Plymouth.

a series of meetings. Family therapists are usually quite eclectic in the range of approaches they may bring to family therapy, and these may include cognitive-behavioural methods, psychodynamic approaches, and systemic analyses depending on the nature of the problem and its underlying causes. In many cases, family therapists may focus on how patterns of interaction within the family maintain the problem (e.g. an eating disorder) rather than trying to identify the cause (the latter may be seen as trying to allocate blame for the problem within the family). Over a period of between 5 and 20 sessions, the family therapist will attempt to identify family interaction patterns that the family may not be aware of, and to suggest to family members different ways of responding to each other. Focus point 34.4 gives an example of the kind of case history that family therapy has to deal with.

Self-test:

- What are the main principles of psychodynamic therapy?
- Can you describe some of the basic techniques used by psychoanalysts?
- Can you describe the behaviour therapy techniques that are based on classical conditioning?

- Can you describe some of the treatment techniques that have been developed based on principles of operant reinforcement?
- Can you describe at least two types of cognitive therapy?
- What are the main theoretical principles on which humanistic therapies are based?
- What are the main principles used in client-centred therapy?
- What is family therapy and how is it conducted?

Assessing the effectiveness of therapies

All of the therapies and treatments we have discussed in the previous sections have at least some degree of intuitive plausibility as treatments for psychological problems. Nevertheless, how do we assess how effective a therapy is? This is not as simple as it sounds, because we have to decide on what constitutes a therapeutic gain (i.e. on what particular measures are we expecting to see improvement?), we often have to try to compare the efficacy of therapies which have quite different assumptions about what ‘successful therapy’ is (e.g. cognitive therapies would expect to see some significant improvement after a few months, whereas psychoanalytic and humanistic therapies are seen as life-long processes promoting self-growth).

However, there are some good reasons for wanting to try and objectively assess how successful therapies are: (1) psychological problems are distressing to the individual, and we have an obligation to try to find ways of alleviating this distress rapidly and effectively, (2) some therapies may have short-term gains, but are significantly less effective over the longer term and may leave the individual open to relapse (e.g. Fava, 2003) – we need to be sure that therapies have lasting therapeutic effects, and (3) individuals with psychological problems are a very vulnerable group of people, and we need to ensure that they are not exploited financially and psychologically by what is a growing industry of essentially bogus therapies with shallow – but often beguiling – rationales, and little or no medium-term therapeutic benefit.

What are the criteria for judging a therapy as successful?

On what basis do therapists decide whether their treatments are successful? Focus point 34.5 provides an interesting example of this that was described by Davey (2002). In effect, it seems that the therapist that he describes in this example assumed that her treatment was being effective because no one ever returned to complain about it! But there may be many reasons why individuals may not complain, and the client in this example is quite happy to return for more therapy even though her first session was unsuccessful! Such is the enmeshed relationship between some therapists and their clients that they may well satisfy the needs of each other (the client helps the therapist earn a living, and the therapist provides the client with some care and attention) without necessarily achieving any substantial therapeutic gain for the client!

The moral of this story is that a client saying they are satisfied with the outcome of the therapy does not mean either (1) that any objective therapeutic gain has been achieved, or (2), if some therapeutic gain was achieved, that it was due explicitly to the type of therapy that was used. It is issues such as this that makes assessing the efficacy of therapies difficult, and we will discuss some of the factors that can confound these assessments in the next section.

FOCUS POINT 34.5

Stop smoking in one session!

‘As I was passing a local ‘holistic’ health clinic, I noticed a sign outside which – in large letters – implored ‘STOP SMOKING IN ONE SESSION’. (which session – surely not the first one?!) Having interests in both clinical and health psychology areas, I was intrigued to find out more. As it turns out, a friend of mine had just recently visited the clinic and had received a single one-hour session of hypnotherapy in an attempt to stop smoking – cost £50. Knowing the literature on psychological treatments for smoking and how difficult it is to achieve abstinence, I decided to find out a little more about these treatment claims. I e-mailed the hypnotherapists offering services at the clinic asking if stopping smoking in one session of hypnotherapy was achievable, and what their success rates were like. I did get a reply from one of the practitioners, who had worked as a hypnotherapist for seven years. She replied: ‘I did not do follow-up calls as I thought this would be intrusive so therefore I did not have stats on my success rates. However, I knew I had a high success rate as people referred others to me and came back to me for help on other issues.’ Interestingly, my friend who had attended the clinic was smoking regularly again within three days of the hypnotherapy session, and – despite having long discussions with me about the validity of the treatment and its lack of success – said she was thinking of attending again (this time in relation to other aspects of her life) because the hypnotherapist had been so caring, understanding and interested in her problems!’

Source: Davey G.C.L. (2002) Smoking them out, *The Psychologist*, Vol. 15, No. 10, p. 499. See www.thepsychologist.org.uk.

Spontaneous remission

Just because some people get better after therapy does not necessarily mean that the therapy is effective. The famous British psychologist Hans Eysenck argued that many people who have psychological problems will simply get better anyway over a period of time – even without therapy (Eysenck, 1961). This is known as spontaneous remission, and the current estimate is that around 30% of those diagnosed with anxiety and depression-based disorders will get better without structured treatment (Jacobson and Christenson, 1996). So, if we are assessing the effectiveness of a therapy we would expect to see improvement rates *significantly greater* than 30% in order to take into account the fact that many of those undertaking the therapy would have spontaneously got better anyway.

Placebo effects

If an anxiety sufferer is give a sugar pill but they are told that it is an anxiolytic medication, they often report significant improvements in their anxiety symptoms. This suggests that individuals will often get better because they *expect* to get better – even though the actual treatment that they have been given is effectively useless (Paul, 1966). This is known as the placebo effect (Paul, 1966). Thus, it may be the case that many psychological therapies have beneficial effects because the client *expects* them to work – and *not* because they are therapies that are effective in tackling the factors maintaining the psychological problems. Unfortunately, the positive gains produced by placebo effects are short-lived, and comparative studies of placebo effects with actual structured psychotherapies strongly suggest that structured psychotherapies lead to greater improvement than placebo control conditions (Robinson et al., 1990; Andrews and Harvey, 1981).

Unstructured attention, understanding and caring

We also know that people with psychological problems also show some improvement in symptoms when they can simply talk abut their problems in an unstructured way with either a professional therapist or a friend or relative (Lambert et al., 1986). This suggests that many forms of social support may have a therapeutic effect in and of themselves (Borkovec and Costello, 1993), and this factor must be taken into account when judging how effective a structured therapy is (Bendall, Jackson, Killackey, Allott et al., 2006). One of the important things that we want to find out about therapies is not just whether they are effective in making people better, but whether they make people better specifically because of the principles they contain (e.g. does psychoanalysis work because of the psychodynamic principles on which that form of therapy is based?) Determining whether a therapy works because of the principles it contains is known as assessing its internal validity.

Methods of assessing the effectiveness of therapies

Randomised controlled trials (RCTs)

The current methodology of choice for assessing the effectiveness of therapies is the randomised controlled trial (RCT) (Barker et al., 2002: 153–159). This procedure compares the effectiveness of the therapy being assessed (across a range of objective measures) with a variety of control conditions, and with other forms of therapy and treatment (if necessary). Participants in the study are assigned *randomly* to each of these conditions. Apart from the therapy being assessed, the control conditions used in RCT are those that will control for the kinds of effects described in the paragraphs above. These will include (1) a ‘no treatment’ or a ‘waiting list’ control group of participants who will receive no treatment (to control for the effects of spontaneous remission); this condition is often difficult to achieve because of the ethical issues involved in withholding treatment from clinically distressed individuals, (2) an expectancy and relationship control group, to control for placebo effects and for the beneficial effects of contact with a therapist, and (3) a comparative treatment group, in which the original therapy can be compared with a plausible alternative therapy that is

CLASS ACTIVITY BOX 34.1

Evaluating your new ‘fairy tale’ therapy for anxiety and insomnia

Imagine that you have just had a great idea – that reading fairy tales every night before you go to bed will relax you and help you sleep better. You are so excited by this idea, and are so sure that it will be successful that you recommend it to all of your friends as a sure way of alleviating anxiety and encouraging restful sleep. You decide to construct an elaborate – but plausible – theory about how your fairy tale therapy works. Your theory argues that ‘fairy tale’ therapy alleviates anxiety because thinking about imaginary stories helps people to realise that most of their own problems are really quite insubstantial.

After trying it for a couple of weeks, some of your friends tell you that reading fairy tales seems no better than having a mug of cocoa at bedtime – they are not convinced that reading fairy tales makes them less anxious or helps them sleep better.

After reading the section entitled ‘Assessing the effectiveness of therapies’, discuss within your class how you would try to construct a study that would enable you to objectively assess whether your fairy tale therapy (1) has any therapeutic benefit at all, and (2) is better than simply having a mug of cocoa. Finally, if your new therapy does have therapeutic benefits, how would you find out if your theory of how it works was correct?

known to have beneficial effects. For the original therapy to be deemed effective and possess internal validity, participants receiving that therapy must show greater improvement than those in either the no treatment and the expectancy and relationship control conditions, and at least equivalent improvement to those in the comparative treatment group.

While providing an objective way of assessing the effectiveness of therapies, RCTs do have a number of practical limitations: (1) Participants do drop out of these studies, and may do so more from some conditions – e.g. the no treatment conditions – more than others, (2) RCTs are costly and time-consuming, and (3) because participants are assigned randomly to conditions, it does not take account of the fact that some participants may prefer some types of therapy to others (Brewin and Bradley, 1989).

What therapies are effective?

So much for attempting to find an empirical and objective way of assessing whether therapies are effective, but what do these studies tell us? Comparative studies tend to suggest that most of the accepted therapies are all more effective than no treatment or expectancy control conditions, but that the therapies themselves do not differ in their relative effectiveness. For example, in a study of depressed individuals, Gibbons, Hedeker, Elkin, Waternaux et al. (1993) found that cognitive therapy, interpersonal therapy, and anti-depressant medication were all as effective as each other, but all more effective than a placebo control condition (after 16 weeks of treatment). Similarly, the meta-analysis conducted by Smith, Glass and Miller (1980) also indicated that psychotherapies were all more effective than no treatment, but none was significantly more effective than another. This has led clinicians to attempt to discover if there are any common features across treatments that contribute to their effectiveness. At least some studies have indicated that regardless of their theoretical orientation and the treatments they offer, successful therapists often have characteristics in common that may contribute to their effective treatment of clients. These include providing good feedback, helping the client to focus on and understand their own thoughts, attempting to promote autonomy and self-efficacy in their clients, and helping the client with their existing relationships (Korchin and Sands, 1983).

Rather than conducting objective and well-controlled outcome studies, some others have approached the issue of the effectiveness of treatments by viewing the client as a consumer and canvassing their views on how satisfied they have been with the treatment ‘product’ that they received. Seligman (1995) reported the results of a large scale survey of individuals in the US who had undergone psychotherapy and concluded that (1) respondents claimed they benefited significantly from psychotherapy, (2) psychotherapy alone did not differ in effectiveness from medication plus psychotherapy, (3) psychologists, psychiatrists, social workers and counsellors did not differ in their effectiveness as therapists, and (4) the longer the duration of their treatment, the larger the positive gains respondents reported. While the empirical rigour of this consumer-based study falls far short of that expected in well-controlled outcome studies, it does provide some information about how the recipients of psychotherapy view their treatment and its effects.

Over the past 10–20 years a large number of studies assessing the efficacy of therapies for psychological disorders has been carried out, and there is now good empirical evidence to support the effectiveness and internal validity of many of these therapies. There are too many to mention here, but the interested reader is referred to Chambless and Ollendick (2001) for a review and analysis of many of these studies, to Butler, Chapman, Forman and Beck (2006) for a review of the effectiveness of CBT for a range of psychopathologies, and to Westen, Novotny and Thompson-Brenner (2004) for a review of the pros and cons of the RCT method for assessing the effectiveness of treatments.

Self-test:

- What are randomised controlled trials (RCTs)?
- How do spontaneous remission and placebo effects bias studies on the effectiveness of treatments for psychopathology?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the principles underlying a range of contemporary therapies, including biological therapies and psychotherapies.
2. Describe the techniques involved in a variety of therapies for psychological disorders.
3. Compare and contrast the approaches to therapy implicit in two or more psychotherapies.
4. Understand the main principles necessary for evaluating the effectiveness of a therapy technique.

Further reading

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Lemma-Wright, A. (1995) *Invitation to Psychodynamic Psychology*. Chichester: Wiley.
Miltenberger, R. G. (2003) *Behavior Modification: Principles and Procedures*. Wadsworth.
Oltmanns, T. F. and Emery, R. E. (1998) *Abnormal Psychology* (2nd edn). New Jersey: Prentice-Hall.
Rogers, C. R. (2003) *Client Centred Therapy: Its Current Practice, Implications and Theory*. Constable & Robinson.
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Essay titles and references

1 Compare and contrast the main principles in any two of the following psychotherapies: psychoanalysis, behaviour therapy, cognitive therapy, humanistic therapy.

2 What kinds of factors can affect the evaluation of treatments, and need to be controlled for in treatment outcome studies?

3 Compare and contrast psychotherapies with drug treatments for psychopathology.

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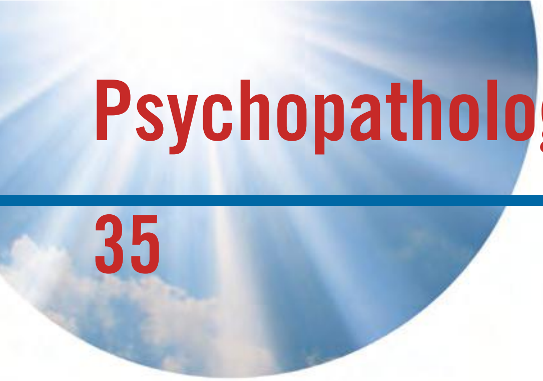


35

Health psychology

Route map of the chapter

This chapter introduces the reader to the relatively new area of health psychology. It begins by describing the topics and activities that make up health psychology, and some of the aims that health psychology has set itself in terms of understanding and changing health-related behaviour. The chapter is then divided into three broad areas, and gives the reader a flavour of how psychological factors play an important role in (1) predicting health-related behaviours, (2) understanding how people interact with health care professionals, and comply with their advice, and (3) understanding physical illness.

What is health psychology?

Who do you think is responsible for your health? Your doctor or GP? Your local health authority? The government? Those who create the environment in which you live and work? Your parents or ancestors who determined your genetic make-up? Or are you responsible?

The traditional approach to health and illness has been that fostered by the biomedical model of medicine. This model seeks the causes of illness in physical entities such as germs and viruses, and sees the corollaries of illness – such as pain – as being caused by physical factors such as tissue damage. Indeed, even recovery from illness within this model is attributed to external physical factors such as surgery and medication. This biomedical model of health and illness is still one that is held today by many in the prominent health professions – but interestingly, it is a model that practically excludes the individual from any responsibility for either their illnesses or their good health.

However, what has become clear over the last 30 years or so is that the individual *is* responsible for many aspects of their own health and well-being – and because of this, psychology has a great deal to offer in terms of understanding and practical advice on matters of health and illness. For instance, many people indulge in activities that are clearly bad for their health (e.g. smoking, excessive drinking and over-eating), and fail to indulge in activities that are good for their health (e.g. exercising regularly, eating healthy foods). Even when they are ill, many people continue to put their recovery at risk by not seeking professional medical help or by not complying with medication regimes prescribed to treat their illnesses. In the late 1970s and early 1980s, these issues gave rise to the area now known as health psychology (Matarazzo, 1980). Health Psychology is the scientific study of the psychological processes of health, illness and health care, and, in particular its contribution to (1) the promotion and maintenance of health, (2) the prevention and treatment of illness, (3) the identification of aetiological and diagnostic correlates of health, illness and related dysfunctions, and (4) the analysis and improvement of the health care system and health policy information. The British Psychological Society set up a Division of Health Psychology in December 1997, and Health Psychologists now serve a wide variety of functions within health care systems (see Chapter 40).

Our definition of health psychology illustrates how wide and varied this area of psychology must be. It not only encompasses the promotion of a nation's health and health policy, but it also examines how individuals communicate with health care professionals, and how their own health beliefs might influence both their physical and emotional well-being. It is also concerned with how stress in a person's life can influence their physical and psychological health, and how coping styles can modulate these effects of stress.

The past 100 years have seen important changes in the patterns of disease, illness and treatments. Many diseases that were once fatal, such as small pox, diphtheria and polio, are now treatable, and are all but eradicated. However, new threats to health continue to appear, and lifestyle factors rather than bacteria or viruses cause many of these. These lifestyle factors are known as behavioural pathogens, and because they represent ways of living, behaving and thinking, they are often more amenable to psychological interventions than physical or medical interventions. In its 2002 report on promoting healthy life, the World Health Organization (WHO) identified the top-

"GET HIV...ME...NO WAY"
ARE YOU POSITIVE?
70% OF HIV INFECTIONS WORLDWIDE OCCUR THROUGH HETEROSEXUAL SEX
stayingalive
12 chunks of canned pineapple
7 cherry tomatoes
1 medium pear
2 satsumas
1 tablespoon of raisins
1 handful of vegetable sticks
2 medium plums
2 broccoli florets
3 heaped tablespoons of sweetcorn
Remember to eat a wide variety of fruit and vegetables ...
and aim for at least 5 A DAY.
5 A DAY
Just Eat More (fruit & veg)

Photo 35.1 Both governments and health organisations spend large amounts of money mounting campaigns designed to change the health behaviours of people around the world. These often take the form of high-impact posters – of the kind shown here – but can also be in the form of sophisticated education and intervention programmes managed by organisations like the World Health Organisation (WHO) (www.who.int).

ten worldwide risks to health as: underweight, unsafe sex, high blood pressure, tobacco consumption, alcohol consumption, unsafe water, sanitation and hygiene, iron deficiency, indoor smoke from solid fuels, high cholesterol, and obesity. Clearly, a majority of these risks are lifestyle ones, which appropriate psychological campaigns and interventions could begin to address. For example, unsafe sex and tobacco consumption need to be addressed through behavioural interventions designed to educate individuals to the risks associated with these activities, and to find effective ways of changing their behaviours. To this extent, psychologists can play an active role in the prevention and treatment of illness and the promotion of good health.

Self-test: What is health psychology, and what are its main areas of study?

Predicting healthy behaviour

In order to begin to effectively change behaviours that might be detrimental to health, we first must understand why people indulge in these unhealthy behaviours. For example, those individuals who smoke or indulge in unsafe sex are almost certainly aware of the health risks involved in these activities – yet many millions of people continue with them. So what are the psychological factors that determine whether they continue with behaviours that are a risk to health?

Health locus of control

The first factor that is important to whether an individual will take up healthy behaviours relates to the question asked at the very beginning of this chapter – Who is responsible for your health? Research on locus of control in social psychology (Rotter, 1966) suggests that people differ as to whether they regard events as controllable by them (an internal locus of control) or whether the events that happen to them are controlled by external factors (an external locus of control). This is a view that can be readily applied to health and illness, and has given rise to the health locus of control model (Wallston and Wallston, 1982). Table 35.1 shows the items in the Health Locus of Control Scale, which measures whether you feel in control of your own health (e.g. 'If I take care of myself I can avoid illness') or whether you believe that your health is determined by factors external to you (e.g. 'I can only do what my doctor tells me to do'). There is now an accumulation of evidence suggesting that if you score high on the internal locus of control scale, then you are more likely to adopt healthy behaviours and reject unhealthy ones (e.g. give up smoking) (Wallston and Wallston, 1984; Pitts et al., 1991). Similarly, if you score high on the external locus of control scale, you are less likely to comply with general medical advice given by your doctor or GP (e.g. to change from an unhealthy to a healthy lifestyle), because the individual high on external locus of control does not see themselves as responsible for their health.

Unrealistic optimism

People are far from objective about assessing the risks that they take with their health. Generally, people have an optimistic bias. That is, if you are asked to respond to the statement 'Compared with others my age, my chances of developing cancer are greater than them / same as them / less than them', most people will judge themselves as being less at risk than their contemporaries. This optimistic bias covers a range of health risks including lung cancer, AIDS, being involved in a traffic accident, and heart disease, and the bias is particularly prevalent during adolescence, where it has come to be known as 'adolescent invulnerability' (Quadrel et al., 1993). The optimistic bias will tend to act to prevent individuals from adopting healthy behaviours, and will continue to provide some justification for indulging in unhealthy or risky behaviours. However, the bias may have some psychological benefit, in that research has shown that those who adopt optimistic perspectives on their life generally are more likely to have better physical and psychological health than those who have pessimistic views (Scheier and Carver, 1992). Nevertheless, Wallston (1994) has argued that there is a distinction between 'cautious' optimists and 'cockeyed' optimists. The former hold optimistic views about their health, but do all they can to ensure that their health is fine. The latter is someone who simply 'lives in hope' and does little or nothing to influence his or her health.

Self-test:

- How does locus of control affect whether someone will adopt healthy behaviours?
- What is the 'optimistic bias'?

TABLE 35.1 THE HEALTH LOCUS OF CONTROL SCALE ITEMS

1. If I take care of myself, I can avoid illness (I)
2. Whenever I get sick it is because of something I've done or not done (I)
3. Good health is largely a matter of good fortune (E)
4. No matter what I do, if I am going to get sick I will get sick (E)
5. Most people do not realise the extent to which their illnesses are controlled by accidental happenings (E)
6. I can only do what my doctor tells me to do (E)
7. There are so many strange diseases around that you can never know how or when you might pick one up (E)
8. When I feel ill, I know it's because I have not been getting the proper exercise or eating right (I)
9. People who never get sick are just plain lucky (E)
10. People's ill-health results from their own carelessness (I)
11. I am directly responsible for my health (I)

Note: I = internally worded, E = externally worded

Source: Wallston et al., 1976

CLASS ACTIVITY 35.1

Who is responsible for your health?

You may like to begin a discussion in your class/seminar group about who is responsible for the health of the individuals in a society – is it the individual themselves, your local health authority, the government? Do you do things to try to make yourself healthier? Do they work? If not, why not? We often complain when a government does not do enough to provide proper health care facilities, but then many people complain of a 'nanny state' when a government attempts to impose standards of healthy behaviour that seem too intrusive or too draconian. Where does the balance lie between government imposed legislation to promote health and the individual's responsibility to do things to maintain their own health?

One of the factors that we have discussed as being important in determining whether an individual will adopt healthy behaviours is their perceived locus of control. Listed below are items from the Health Locus of Control Scale, and you may want to discuss each of these items in your group, see how many members of your group would endorse these items, and see if that will affect their intentions to adopt healthy behaviours.

1 If I take care of myself, I can avoid illness (I)
2 Whenever I get sick it is because of something I've done or not done. (I)
3 Good health is largely a matter of good fortune (E)
4 No matter what I do, if I am going to get sick I will get sick (E)
5 Most people do not realise the extent to which their illnesses are controlled by accidental happenings (E)
6 I can only do what my doctor tells me to do (E)
7 There are so many strange disease around that you can never know how or when you might pick one up (E)
8 When I feel ill, I know it's because I have not been getting the proper exercise or eating right (I)
9 People who never get sick are just plain lucky (E)
10 People's ill health results from their own carelessness (I)
11 I am directly responsible for my health (I)

I = Internally worded, E = Externally worded
(Source: Wallston, Wallston, Kaplan and Maides, 1976. Copyright 1976 by the American Psychological Association. Adapted with permission.)

Health belief models

The previous section describes just two individual factors that might affect whether a person indulges in healthy behaviours or not (health locus of control and unrealistic optimism). However, there are many more factors than this that will determine whether you act healthily or not, and researchers have attempted to put these factors together in what have come to be known as health belief models. These models tend to describe those factors that predict health behaviours, and try to explain how these predictors

WOT NEXT ?—ONE OUT OF THE 'SMOKING SHORTENS YOUR LIFE' PACKET OR SHALL WE GIVE 'SMOKING KILLS' A GO ?
LAWTON.

influence the set of 'health beliefs' that every individual has. The models derived in this way are usually based on the biopsychosocial view of health, which incorporates (1) the biological and genetic factors that are involved in many illnesses, (2) the psychological factors, such as beliefs, that may inform behaviour change, and (3) sociological and demographic factors, such as age, race, peer- or reference-group, etc. Also, many of these models attempt to explain how the 'costs' and 'benefits' of health behaviours are weighed up and contribute to health beliefs. For example, if an individual believes that giving up smoking will prevent them from getting lung cancer, then they are more likely to give up smoking. But this has to be weighed up against the 'costs' of giving up, one of which might be the discomfort of nicotine withdrawal.

The Health Belief Model (HBM)

One of the first models of this kind was the original Health Belief Model developed by Rosenstock (1966), which was subsequently modified by Becker and Maiman in 1975 (see Figure 35.1). This model attempts to explain health behaviour in terms of both health beliefs and compliance with treatment, and is a valuable tool for predicting health behaviours before the onset of illness by calculating risk factors and the probability of compliance with treatment after diagnosis.

In particular, the Health Belief Model predicts that an individual is most likely to take preventative health action if (1) they feel susceptible to disease through either genetic or behavioural factors (*perceived susceptibility*), (2) they believe the disease could have potentially serious consequences (*perceived severity*), that taking preventative action will be beneficial in preventing the illness (*perceived benefits*), (4) the costs (such as pain) do not outweigh the perceived benefits of the health action, and (5) health promotions and

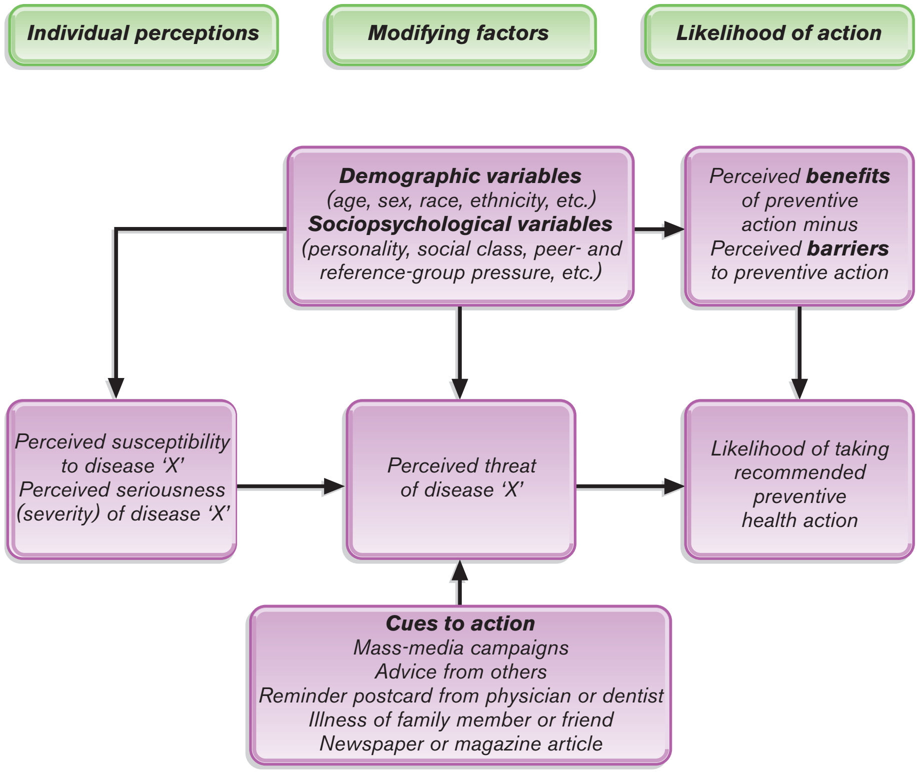

Individual perceptions
Modifying factors
Likelihood of action
Demographic variables (age, sex, race, ethnicity, etc.) Sociopsychological variables (personality, social class, peer- and reference-group pressure, etc.)
Perceived benefits of preventive action minus Perceived barriers to preventive action
Perceived susceptibility to disease 'X' Perceived seriousness (severity) of disease 'X'
Perceived threat of disease 'X'
Likelihood of taking recommended preventive health action
Cues to action
Mass-media campaigns
Advice from others
Reminder postcard from physician or dentist
Illness of family member or friend
Newspaper or magazine article

Figure 35.1 The health belief model

motivators (e.g. government health campaigns) prompt some kind of action by the individual (*cues to action*). This model has been relatively helpful over the years, and has been successful in predicting compliance with vaccination and screening programmes (Harrison *et al*., 1992).

The Theory of Planned Behaviour (TPB)

Arguably, the most popular of the current crop of health belief models that have been directly applied to health promotion is the Theory of Planned Behaviour (Ajzen and Madden, 1986; Fishbein and Ajzen, 1975). This model was derived from research in social psychology, and in particular from the theory of reasoned action. It is based on the view that an individual's behaviour is always planned, and that planning is determined by an individual's intentions. This being the case, the model attempts to define those factors that are important in determining intentions. In particular, intentions are a function of three discrete factors: (1) personal attitudes towards a particular behaviour defined by weighing up the pros and cons of that behaviour (e.g. 'I will enjoy giving up smoking because I will save money'); (2) the individual's beliefs about what is an acceptable way to behave and what others will think of them (e.g. 'My family will approve if I give up smoking'); and (3) whether the individual believes they can achieve the behavioural goal and have the internal resources and ability to overcome any obstacles (e.g. 'I think I can give up smoking because I've been able to kick bad habits in the past'). The TPB model has been successful in the past at predicting a number of health-related activities, including testicular self-examination (Brubaker and Wickersham, 1990) and attaining weight-loss goals (Schifter and Ajzen, 1985). However, as many people point out, the TPB model has one major drawback – it relies heavily on the assumption that intentions lead to behaviours, and, as we all, know, that is not necessarily the case!

Self-test:

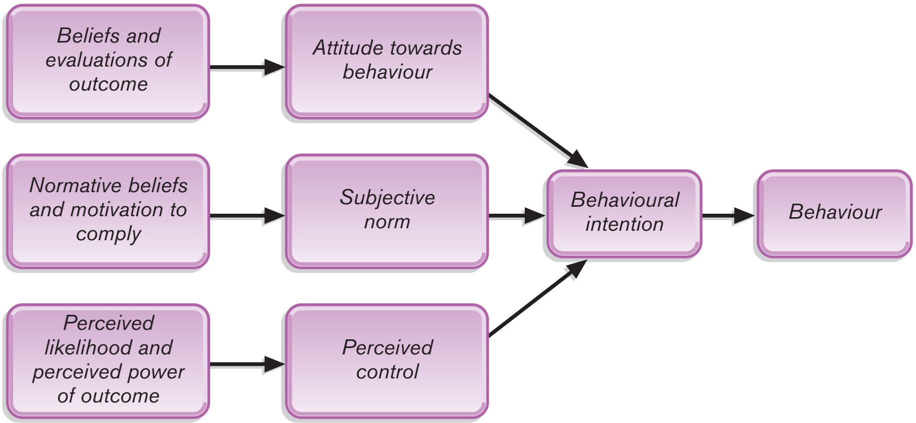
- What are health belief models?
- What is the biopsychosocial view of health?
- Can you describe the main features of the Health Belief Model?
- What are the main features of the Theory of Planned Behaviour, and what are its main predictions?

Communication and compliance

Good health can also be dependent on two other important factors: (1) whether or not we decide to seek professional medical help for our illness symptoms, and (2) how we communicate our symptoms to these health professionals. Understanding the psychological processes that contribute to these two factors is therefore of some importance.

'Going to the doctor': seeking professional health care advice

On what basis do we decide that we need to visit our GP? Some individuals – such as those often labelled as the 'worried well' – visit their GPs for a consultation at the slightest opportunity or with the most minor of symptoms. However, others will resist visiting their GP's surgery at all costs – even to the point where an illness requires hospitalisation and urgent attention. Last (1963) first coined the phrase 'illness iceberg' because the majority of illnesses are actually never reported to a health care professional. From a random sample of individuals who were asked to complete a symptom checklist, Hannay (1980) found that 26% of sufferers who reported one severe symptom did not actually consult a doctor. So what are the factors that make an individual decide to visit a doctor for a consultation? Pendleton et al (1984) argued that noting a *change* in their health led to an individual making one of three decisions about their condition: (1) a decision for *no care* – e.g. we may wake up one morning with a headache, and probably decide that it is due to drinking too many beers the night before; we assume this condition will get better before the day is out and does not require further help or advice; (2) a decision for *self-care* – e.g. if we wake one morning with a sore throat and runny nose we may well decide we have a cold, and treat this ourselves by going to the local chemist or pharmacy for some basic medication; and (3) a decision



Beliefs and evaluations of outcome
Attitude towards behaviour
Normative beliefs and motivation to comply
Subjective norm
Behavioural intention
Behaviour
Perceived likelihood and perceived power of outcome
Perceived control

Figure 35.2 The theory of planned behaviour

for *alternative care* – e.g. if we wake up one morning and have a violent headache, runny nose, sore throat and a high temperature, and these symptoms last for some considerable time, we will most likely make a decision to consult a doctor.

There are also a number of demographic factors that are important in determining whether you will consult your doctor: (1) Age is important, with the young and the old most likely to consult a doctor or health care consultant (the former because growing up involves childhood diseases, vaccinations, and the latter because old age usually means a frailer body, susceptibility to infection and disease); (2) Gender is also important, with women more likely to consult than their male counterparts; this is not just because women consult more on pregnancy and contraception matters (Verbrugge, 1985), but probably because consultative health care for females is more developed in Western cultures than it is for men (i.e. there are more 'Well Woman' clinics that there are 'Well Men' clinics).

Communication and compliance

Making a decision to visit your doctor or GP for a consultation is the first step in the process towards getting suitable treatment for illness symptoms. The next two stages are equally important, and these are (1) how you communicate with the doctor during the consultation, and (2) how you receive and comply with the advice and treatment given by your doctor.

Doctor–patient communication

According to Pendleton et al (1984) 'the consultation is the central act of medicine and as such deserves to be understood'. A GP will normally see around 6000 patients a year, making a total of around 10,000 GP consultations per day in the UK alone. What is unusual about the doctor-patient consultation is that, unlike many other types of conversations and discussions, (1) the topic of the consultation is very specific (i.e. the patients immediate symptoms), and (2) both doctor and patient bring to the consultation expectations about the outcome. The expectations brought to the consultation by both parties can often confuse the diagnostic process. For example, Tate (1994) estimated that doctors usually made an initial diagnosis within 30 seconds of the consultation, and the effects of this tendency towards rapid diagnosis can be far reaching – especially since it is unlikely that patient will have divulged their major symptomatology first, but is more likely to build up to their main symptoms. This often leads to doctors systematically distorting the information given later in a consultation to fit the diagnosis that had been made earlier (Wallston, 1978). On the patient's part, they will often enter a consultation with their own view of what is wrong with them, and they will describe their symptoms to fit their own theory. Such are the complexities of the doctor-patient consultation that studies have estimated that (1) up to two thirds of all psychosocial or

RESEARCH METHODS BOX 35.1

In 1995, Scott, Deary and Pelosi published an intriguing article in the *British Medical Journal* describing the attitudes of GPs to patients who presented for a consultation with a self-diagnosis of ME (myalgic enphalomyelitis) or chronic fatigue syndrome (CFS).

Method

They selected 200 GPs at random and sent them a written case history that described Mrs M, a 28-year-old personnel officer for a computer firm who had a history of good health. The case history described how she attended the surgery complaining of general malaise that had lasted for six months. The malaise had increased in severity and by the time she had consulted the doctor she also had intermittent stomach pains, severe tiredness, and insomnia. She also reported crying for no apparent reason. Mrs M said she had no financial, marital or social problems. A physical examination that included a full blood count, urea and electrolytes, liver function and thyroid tests produced no abnormalities.

Half of the GPs received the description with Mrs M's occupation changed to that of an office cleaner. The following sentence was also included in 50% of the descriptions: 'Mrs M had read newspaper articles about CFS and believed that this was her problem'. This meant the study was a simple 2 × 2 design in which the researchers varied (1) Mrs M's occupation, and (2) information about whether Mrs M had knowledge of CFS or not.

All GPs were asked how they would manage the hypothetical patient describe din the their case history, and their attitudes towards them.

Results

The results showed that GPs (1) were more likely to refer Mrs M for counselling if she was described as a personnel officer, and not when she was described as an office cleaner, (2) believed that self-diagnosis would make the patient less likely to comply with treatment, and would take up more of their time, and (3) were less inclined to have patients who self-diagnosed on their lists, and were more likely to refer them for a second opinion.

Conclusion

This study shows quite clearly how factors such as social class and self-diagnosis can influence the diagnostic process, and result in GPs adopting negative attitudes towards their patients.

psychiatric problems are missed during GP consultations (Goldberg and Blackwell, 1970), (2) over half of patients' actual symptoms fail to be identified during a consultation and (3) around 50% of all consultations end in the doctor and patient failing to agree on the main presenting problems (Starfield et al., 1981).

With such potential for disagreement and misinformation, the doctor-patient consultation needs to be carefully conducted, and guided by a clear set of goals that need to be achieved. Pendleton et al. (1984) have outlined a set of guidelines by which the consultation should be conducted. The doctor should: (1) ensure that the *reason* for the patient's attendance is clearly defined, (2) consider problems other than the specific ones mentioned by the patient, (3) together with the patient, choose an appropriate action for each problem, (4) achieve a shared understanding of the problem with the patient, (5) involve the patient in the management of the problem and encourage them to accept appropriate responsibility for this management, (6) use time and resources appropriately and effectively, and (7) establish and maintain a relationship with the patient which will help to achieve future goals.

Compliance

In the context of health psychology, the term compliance can be defined as 'the extent to which the patient's behaviour (in terms of taking medication, following diets or other lifestyle change) coincides with the medical or health advice' (Haynes et al., 1979). This is an important topic for study – not least because the costs of non-compliance, in terms of the patients health and the economic cost of wasted prescriptions and medications, is enormous. Some important factors have been identified which appear to influence whether a patient will be compliant or not, and are summarised in Ley's (1989) cognitive model of compliance. First, the degree to which a patient actually *understands* the terminology and the explanations given by the doctor will affect compliance, and many GPs confuse their patients by using technical language and terms that have different medical and lay meanings (e.g. depression, hysteria – Hadlow and Pitts, 1991). Second, even if patients understand what has been discussed during the consultation, they are likely to *remember* only a small percentage of what they are told; Ley and Spelman (1965, 1967) found that around 40% of what had been said during a consultation was immediately forgotten by the patient. Since there is likely to be a link between understanding and recall of the consultation, then there is also a link between poor recall and compliance. Third, Korsch *et al*. (1968) found a clear relationship between patients' *satisfaction* with the consultation and subsequent compliance. Patient satisfaction appeared to derive from (1) the doctor being friendly rather than business-like, (2) the doctor appearing to understand the patient's concerns, (3) the patient's expectations about the consultation and treatment being met, (4) the doctor being perceived as a good communicator, and (5) the doctor providing full and clear information. However, while the involvement of these factors in compliance may make intuitive sense, Ley's model is largely a correlational one. This means that although there is good evidence for significant relationships between these variables, there is no evidence yet that they exact a *causal* influence on compliance.

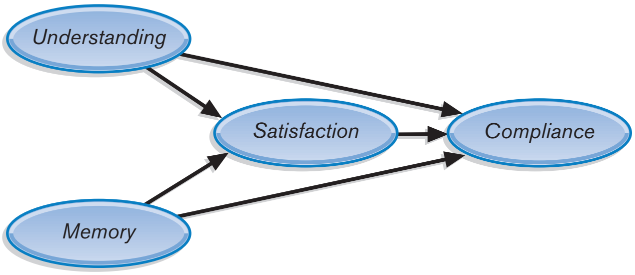


Figure 35.3 Ley's model of compliance

Self-test:

- What factors affect whether an individual will seek help and advice from a health care professional such as a doctor?
- What are the main features of the patient–doctor communication process?
- What factors affect whether a patient will comply with the advice and treatment given by a doctor?

The psychology of illness

Psychology plays a central and important role in many forms of physical illness. Have you ever developed a rash or a headache because you were worried about something? Or picked up a cold, tonsillitis or a sore throat while you were taking a series of exams? Psychological factors can influence physical illness in a variety of ways. They can make you more susceptible to picking up infectious illnesses by affecting your immune system (this is known as psychosomatic illness). For example, stress is associated with reduced numbers of lymphocytes, reduced levels of sIgA (a particular form of antibody), reduced NK cell activity (the 'Natural Killer' lymphocyte), and raised antibody levels to herpes viruses (Herbert and Cohen, 1993). Stressors can also cause changes in behaviour which may have illness-related consequences. For example, stress has been linked to: (1) the onset of smoking in adolescents (Wills, 1985), and to an increase in the desire to smoke (Perkins et al., 1992); (2) an increase in the consumption of alcohol (Gupta and Jenkins, 1984); and (3) an increase in eating – especially in females (Michaud et al., 1990). All of these behaviours are ones that would be categorised as unhealthy consequences of stress.

Not only do psychological factors have a direct and indirect impact on physical health, they can also influence how we experience some aspects of illness – especially pain. The experience of pain is not simply an inevitable consequence of tissue damage; it is something that is determined in important ways by psychological and cognitive factors.

This section of the chapter will discuss two important elements of psychology and illness – the first is the effects of stress, and the second is the experience of pain.

Stress, stressors and coping

The term 'stress' has traditionally been a difficult one to define – not least because what is stressful for one person often isn't stressful for another. There are three ways in which stress can be defined: (1) as external or environmental forces that create a stressful reaction (e.g. difficulties at work); (2) as something experienced by the individual (e.g. feelings of tension or pressure); and (3) as a physiological reaction that affects the autonomic nervous system (ANS) causing changes in arousal, hormone secretion and general physiological alertness.

The role of life events

Stress doesn't normally just happen to people it is usually triggered by some external or life event, or a series of life events – most of which will represent either challenges (e.g. a new job), losses (e.g. death of a close relative), or threats (e.g. the threat of redundancy). Stress-inducing life events can come in a number of forms. Holmes and Rahe (1967) studied the kinds of life events or life changes that preceded periods of illness or stress, and drew up a table of events according to their seriousness or likelihood of inducing stress or illness. The ranked list of 43 events is shown in Table 35.2. While there is little doubting that most people would consider those life events near the top of the list as possible major stressors, identifying these life events is not alone sufficient to enable us to predict either that an individual will be stressed, or the level of stress they will experience. For example, divorce or death of a close family member, are events that may not be so stressful if they are expected or predicted, and being able to predict a stressor gives the individual time to adapt to it (Parkes, 1993). Similarly, life events are usually stressful only if they are perceived to be uncontrollable (Brown, 1986).

The life events described by Holmes and Rahe are relatively discrete events that are experienced over a fixed period of time. However, many stressors may be chronic and on-going and result in chronically experienced stress that is more enduring and debilitating than single life events. Moos and Swindle (1990) identified the most serious of these chronic stressors as (1) physical health stresses and chronic medical conditions, (2) home and neighbourhood stressors (e.g. safety, cleanliness), (3) financial stressors, (4) work stressors (work pressure, interpersonal problems), (5) spouse/partner stressors (e.g. emotional problems with partner), (6) child stressors (e.g. child care), (7) extended family stressors (e.g. caring for an elderly or ill relative), and (8) friend stressors (e.g. maintaining cordial relations with close friends).

Finally, while major life events may act as triggers for stress, it is clear that stress can be caused on a day-to-day basis by a wide variety of minor irritants. These are known as 'daily hassles' and are defined as 'the irritating, frustrating, distressing demands that to some degree characterise everyday transactions with the environment' (Kanner et al., 1981). Daily hassles include losing things, traffic jams, inclement weather, finding the coffee jar is empty, arguments, etc. A number of studies have indicated that the frequency of 'daily hassles' is a better predictor of stress and physical health than major life events (Weinberger et al., 1987; Kanner et al., 1981). In addition, the severity and frequency of daily hassles has been shown to mediate the relationship between major life events and psychiatric symptomatology (Johnson and Sherman, 1997), to be associated with diagnoses of chronic fatigue syndrome (CFS) (Van Houdenhove et al., 2002), and to predict eating bouts in women identified as binge eaters (Crowther et al., 2001).

Coping and transactional models of stress

The individual is not just a passive recipient of stressful life events, but indulges in a variety of activities designed to appraise the stressor and to cope with its effects. What these activities are and how they are conducted can have important ameliorative effects on the stressor's impact.

Lazarus and Folkman (1984) argued that stress involves a 'transaction' between the individual and their world in which their first reaction to a stressor is to appraise it. First, the individual initially appraises the event itself, and this is known as primary appraisal. During primary appraisal, the individual will appraise the event as (1) irrelevant, (2) benign and positive, or (3) harmful and negative. If the event is appraised as harmful or negative, the individual then undertakes a secondary appraisal, which involves them assessing the various coping resources they have available, and deciding on the best way to deal with the stressor (Lazarus and Folkman, 1984).

The primary appraisal process itself is important, and people use a variety of appraisal strategies – many of which explicitly function to reduce the stressful impact of the stressor. Such strategies include those described in Table 35.3, each of which enables the individual to cognitively reduce the negative impact of the stressor (e.g. downward comparison) or to re-define it as an event possessing positive characteristics (e.g. positive reappraisal). Studies have shown that the use of these 'neutralising' appraisal strategies reduces experienced stress, increases subjective well-being, and facilitates the use of active, task-oriented coping with the stressor (Gibbon and Gerrard, 1989; Taylor et al., 1983; Aspinwall and Taylor, 1990).

Pain

Most early theories of pain did not consider psychological factors, and pain was seen as being a simple physiological consequence of tissue damage. However, three factors

TABLE 35.2 Holmes and Rahe's (1967) Social Readjustment Rating Scale (SRRS) ranks life events according to their severity and intensity, and the amount of time required to adjust to them. While this will give you an indication of the kinds of life events that cause stress, remember that this list was compiled over 30 years ago, and some of the items may not now be relevant to contemporary life.

Rank	Life Event	Weighting
1	Death of Spouse	100
2	Divorce	73
3	Marital Separation	65
4	Jail term	63
5	Death of Close Family member	63
6	Personal Injury or Illness	53
7	Marriage	50
8	Fired at Work	47
9	Marital Reconciliation	45
10	Retirement	45
11	Change in Health of Family Member	44
12	Pregnancy	40
13	Sex Difficulties	39
14	Gain of New Family Member	39
15	Business Readjustment	39
16	Change in Financial State	38
17	Death of Close Friend	37
18	Change to Different Line of Work	36
19	Change in Number of Arguments with Spouse	35
20	Mortgage over $10,000	31
21	Foreclosure of Mortgage or Loan	30
22	Change in responsibilities at Work	29
23	Son or Daughter leaving Home	29
24	Trouble with In-Laws	29
25	Outstanding Personal Achievement	28
26	Wife begins or stops Work	26
27	Begin or End School	26
28	Change in Living Conditions	25
29	Revision of Personal Habits	24

TABLE 35.2 (CONTINUED)

Rank	Life Event	Weighting
30	Trouble with Boss	23
31	Change in Work Hours or Conditions	20
32	Change in Residence	20
33	Change in Schools	20
34	Change in Recreation	19
35	Change in Church Activities	19
36	Change in Social Activities	18
37	Mortgage or Loan less than $10,000	17
38	Change in Sleeping Habits	16
39	Change in Number of Family Get-Togethers	15
40	Change in Eating Habits	15
41	Vacation	13
42	Christmas	12
43	Minor Violations of the Law	11

played an important role in alerting researchers to the role of psychological factors in pain (Ogden, 2000). First, drugs and other medical treatments for pain were only found to be effective for treating acute pain, and were relatively ineffective for chronic pain. Second, a study reported by Beecher (1956) suggested that the perception and experience of pain might depend on factors other than simple tissue damage. He noted the requests of civilians and soldiers for pain relief in a hospital during the Second World War. Although the extent of the physical injuries found in both civilians and soldiers were very similar, over 80% of the civilians requested pain relief, but only 25% of the soldiers. Beech suggested that the *meaning* of the injury for the soldiers was different to that for the civilians: for the soldiers it meant they were alive and were due to go home. Thus, it appeared that the meaning attached to an injury could attenuate experienced pain. Third, it has often been noted that individuals who have had a limb amputated still continue to report experiencing pain in the non-existent limb (the phantom limb phenomenon). This can occur even after the wounds caused by amputation have fully healed. Consistent with this is the finding that fewer than 15% of persons with back pain have an identifiable physical problem with their back (Fordyce, 1995). This suggests that experiences of pain can be

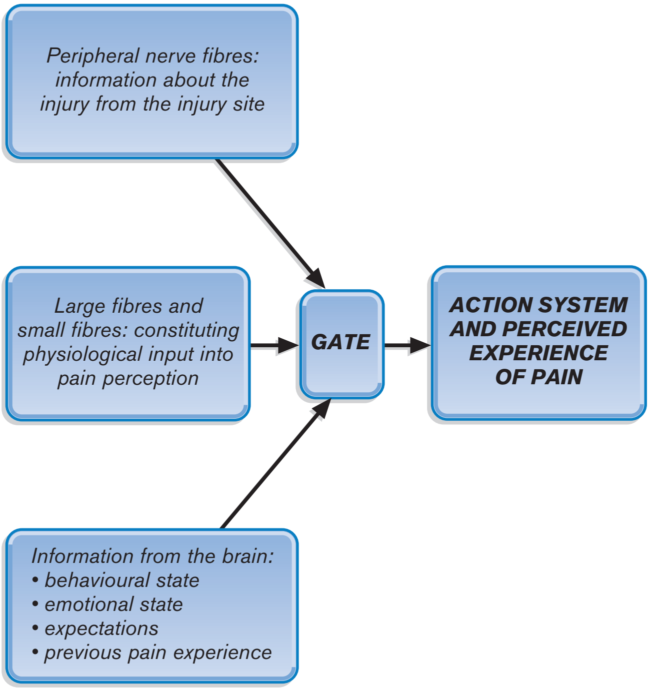

Peripheral nerve fibres: information about the injury from the injury site
Large fibres and small fibres: constituting physiological input into pain perception
GATE
ACTION SYSTEM AND PERCEIVED EXPERIENCE OF PAIN
Information from the brain:
• behavioural state
• emotional state
• expectations
• previous pain experience

Figure 35.4 The gate control model of pain

TABLE 35.3 People often use a variety of cognitive strategies for 'downwardly' appraising a stressor – and these function either to reduce the stressful impact of the stressor or to redefine it as an event that possesses positive characteristics. Some examples are given below:

Appraisal Strategy	Example	Effect
Downward Comparison	'This is not as bad as the things that happen to other people – they are much worse off than me'	Reduces the *relative* impact of the stressor
Positive Reappraisal	'I will come out of this experience better than I went in'	Redefines the stressor as a challenge from which personal growth is a positive outcome
Cognitive Disengagement	'This situation isn't worth getting upset about'	Downgrades the stressor as something that is irrelevant
Optimism	'Everything will work itself out OK in the end'	Reduces the impact of the stressor by focusing on a positive rather than negative outcome
Faith in Social Support	'I have others who can help me through this'	Focuses on a positive outcome based on existing support and resources
Life Perspective	'I can put up with this as long as everything else in my life is OK'	Reduces the relative impact of the stressor by comparing it with positive features of life

generated even when there is no evidence of physical injury or tissue damage.

The gate control theory of pain

One of the first theories of pain to include psychological factors was Melzack and Wall's (1965, 1982) gate control theory of pain. They argued that a gate exists at the level of the spinal cord that integrates three sources of input: (1) information about the injury received from the site of the injury; (2) descending input from the brain, providing information about the individual's behavioural state (e.g. attention towards the pain) and emotional state (e.g. anxiety or fear), and information about previous pain experiences (e.g. 'I know from previous experience that this type of pain doesn't last long'); and (3) input from large and small fibres which make up some of the physiological input into pain perception. The gate integrates the information from these three types of input and then produces an output that determines the perception of pain; the greater the output – the greater the perception of pain. Melzack and Wall argue that the gate's output can be influenced by the physical extent of the injury, or by psychological factors such as anxiety or worry, and focusing on the pain.

While the gate control theory was appealing as the first model to integrate physical and psychological factors into an explanation of pain perception, it has a number of deficiencies. First, there is as yet, no evidence that a 'gate' that integrates the three sources of information exists. Second, it is a model that still relies heavily on physical factors as the initiator of pain, and some evidence – such as the phantom limb example – suggests that pain can be experienced without *any* physical input.

Cognitive models of pain

More recent conceptualisations of pain rest heavily on psychological and cognitive factors as critical determinants in the perception of pain. In particular, there appears to be an important link between pain, anxiety and depression, with catastrophic interpretations of pain being associated with higher levels of depression (Rosenteil and Keefe, 1983) and anxiety (Asmundson et al., 1996). Because of their affliction, it seems intuitively reasonable to suppose that pain sufferers should be more anxious and depressed than others. However, a number of theorists have suggested that it is the high levels of anxiety and depression that *cause* heightened pain perception, rather than *vice versa* (Philips, 1987; Lethem et al., 1983). This has been related to the concept of pain anxiety (McCracken et al., 1992), which suggests that some individuals are fearful of pain, and as such have developed a phobia of pain that makes them hypervigilant for pain cues and anxious about these cues when they detect them. The subsequent anxiety then leads to the catastrophising of pain symptoms, and heightened experience of pain (Crombez et al., 1998). Similarly, how the individual interprets the pain experience also has an impact. Those who interpret their pain as being indicative of more tissue damage or illness tend to be more avoidant and more disabled than those who do not have such an interpretive bias (Vlaeyens et al., 1995), and, indeed, fear of pain is a better predictor of disability than either pain severity or physical pathology (Crombez et al., 1998). While cognitive theories of pain such as these are still in their infancy, they are already capable of generating a range of useful interventions for alleviating and controlling pain in chronic pain sufferers (McCracken and Turk, 2002; Turner, 1996; Eccleston et al., 2002).

Self-test:

- How is stress defined?
- Can you describe the different kinds of life events that may cause stress?
- What is the transactional model of stress?
- What is the gate control theory of pain?
- How do psychological factors affect the perception of pain?

Summary of health psychology

As we mentioned at the outset of this chapter, health psychology is a relatively new branch of psychology that is an important area of research and a growing branch of applied psychology. It covers the scientific study of the psychological processes of health, illness and health care, and we have given you a flavour of some of these topics in this chapter. In general, health psychology attempts to understand those factors that predict or cause healthy or unhealthy behaviours, it attempts to understand the psychological processes that influence the beliefs we have about health and illness, and it also attempts to try to understand those psychological factors that may influence illness – including understanding how stress and coping influence both mental and physical health, and how we perceive and cope with pain.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe the topics that make up health psychology, and describe the aims of health psychology as an academic and applied field of study.
2. Compare and contrast at least two models developed to predict health behaviour.
3. Describe some of the psychological processes that contribute to doctor–patient communication and the patient's compliance with treatment and health advice.
4. Critically assess how psychology contributes to an understanding of physical illness.

Further reading

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Michie, S. and Abraham, C. (2004) *Health Psychology in Practice*. Oxford: Blackwell.
Morrison, V. and Bennett, P. (2005) *An Introduction to Health Psychology*. Buckingham: Open University Press.
Ogden, J. (2007) *Health Psychology: A Textbook*. Buckingham: Open University Press.
Taylor, S. E. (2003) *Health Psychology* (5th edn). Boston: McGraw-Hill.

Essay titles and references

Any of the textbooks in the 'Further reading' section will help you attempt these essay topics, and some additional specific reading for each essay title is included.

1 Compare and contrast any two models that try to predict whether an individual will act healthily or not.

Ajzen, I. and Madden, T. J. (1986) Prediction of goal directed behavior: Attitudes, intentions and perceived behavioral control. *Journal of Experimental Social Psychology*, 22, 453–474.

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Schifter, D. E. and Ajzen, I. (1985) Intention, perceived control, and weight loss: An application of the theory of planned behavior. *Journal of Personality and Social Psychology*, 49, 843–851.

Webb, T. L. and Sheeran, P. (2006) Does changing behavioral intentions engender behaviour change? A meta-analysis of the experimental evidence. *Psychological Bulletin* 132 (2): 249–268.

2 What factors affect a person's decision to seek advice from a health care professional (e.g. their GP)?

Pendleton, D., Schofield, T., Tate, P. and Havelock, P. (1984) *The Consultation: An Approach to Learning and Teaching.* Oxford: Oxford University Press.

Vermeire, E., Hearnshaw, H., Van Royen, P. et al. (2001) Patient adherence to treatment: three decades of research. A comprehensive review. *Journal of Clinical Pharmacy and Therapeutics,* 26 (5): 331–342.

3 What is stress and how do people cope with stress?

Diener. E., Suh, E. M., Lucas, R. E. et al. (1999) Subjective well-being: Three decades of progress. *Psychological Bulletin,* 125 (2): 276–302.

Lazarus, R. S. and Folkman, S. (1984) *Stress, Appraisal and Coping.* New York: Springer.

Skinner, E. A., Edge, K., Altman, J. et al. (2003) Searching for the structure of coping: A review and critique of category systems for classifying ways of coping. *Psychological Bulletin,* 129 (2): 216–269.

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Answers

1 They can be, but not always.

2 None. Violence towards others is not on any diagnostic criteria. For every person killed by someone with a mental illness there are roughly 70 deaths on the road and 10 alcohol-related deaths. We are far more likely to be assaulted by someone we know, in our own homes, than by a random stranger with a mental illness. People with mental health problems are more likely to be victims than perpetrators of violence.

Interestingly, approximately 70% of media coverage links mental distress to violence.

3 Highest risk group is 18–25 years.

4 False – most people who commit suicide usually tell someone of their intentions within the prior 2 months.

5 False.

6 (c) 1 in 4. However, this is only the number of people who we know about, who have sought help. The associated stigma means that many will be too embarrassed to seek help.

7 25% (source: National Service Framework for Mental Health, Department of Health).

8 True.

9 16–25 years and over 65 years.

10 (a) 47%

(b) 38%

11 (a) Comical, and (b) violent to themselves and others. These stereotypes are found in fictional accounts and 'factual' reporting. This means that the key messages from the media are that if someone has a mental illness we should:

- feel sorry for them
- be afraid of them
- laugh at them

50% of people surveyed by Mind said that media coverage had a negative effect on their mental health. Effects included feeling more anxious or depressed and experiencing hostility from neighbours. A third of respondents said family or friends reacted to them differently because of recent media coverage.

Adapted from Student Psychological Health Project, Educational Development and Support Centre, University of Leicester (www.le.ac.uk/edsc/sphp) and 'Looniversity Challenge', a mental health awareness quiz provided by mental health awareness group 'Fifteen Training and Development', Brighton, UK (reprinted from Davey, 2008).

sectioneight

Andy Field

Research methods and statistics

36 Why do we need research methods? 540
37 Collecting data 553
38 Summarising data 568
39 Going beyond your sample 586

Research methods and statistics

36

Why do we need research methods?

Route map

The question on most psychology students' lips as they discover that they have to do 2 years of research methods is 'Why do we need research methods?' On the face of it, it might seem like we just like torturing psychology students by making them learn lots of complicated statistics and the like. Actually, that's not the reason: most of us are nice really. The reason is that psychology is a scientific discipline that tries to understand human behaviour by using research to test and develop ideas about what drives our thoughts and behaviours. This chapter attempts to describe the research process in general terms to give you a background as to why we need research methods, and some of the important issues that we need to consider when conducting psychological research. We start by looking at how theories and research are intrinsically linked, before looking at how we can test theories (and why it's important to measure things). We then look at how we can try to identify cause and effect relationships and how we analyse data.

Linking theories and research

If you ask yourself why you're studying psychology (or reading this book) the answer would probably be something like 'because I'm interested in why people do the things they do'. You might have a particular interest in why people do everyday things ('Why do we sleep?'), why they do unusual things ('Why does our friend sing "You've lost that loving feeling" by the Righteous Brothers after four pints of Stella Artois?'), or why groups of people do things ('Why does the England football team always seem to play so badly?'). In all of these cases you're interested in answering a question. Scientists are curious people, and psychologists are curious *about* people. To answer these questions you need to have two things: data and an explanation of those data.

For example, it's very curious why people who clearly cannot sing in tune go to the *X Factor* TV show auditions. These people are humiliated in front of millions of people and their motivation is a mystery. Having made this casual observation we could collect some data to see if this observation is correct. To do this, I need to define one or more variables that I would like to measure. In this case, my variable would be 'singing ability', and I could measure this perhaps by getting an expert to listen to a person singing and to make a simple judgement: 'yes they can sing', or 'no they cannot sing'. Let's assume that I did this and found that 40% of contestants could sing, but the remaining 60% could not. The next logical thing is to try to explain these data. One explanation is that the people who cannot sing don't know that they sound like a dog barking at the moon. This is a *theory*. Having come up with a theory we can test it: we might go to the contestants who couldn't sing and simply asked them 'Do you think you're a good singer?' we might find that 80% of them think that they are good singers. Is our explanation a good one? Well, it does explain the data: we proposed that the bad singers don't realise that they are bad, and for 80% of them this is true. However, it doesn't explain all of the data: there are 20% who are fully aware that they warble like fingernails being scratched down a blackboard. It also doesn't explain *why* they don't realise they are bad.

One reason why they might not realise they are bad is because they are tone deaf. This is another theory, and we can test it by looking at what predictions can be made from the theory. If they are tone deaf then we would predict that they are unable to distinguish between the sounds of different notes on a keyboard. A prediction from a theory, like this one, is known as a hypothesis. We could test this hypothesis by playing them pairs of notes and asking them whether the notes are the same or different.

Imagine we did such a test and found that these people were not tone deaf. What does this say about our theory? Well, obviously the theory is wrong: the data collected are not consistent with the prediction that arose from the theory.

It's unlikely that we would be the only people interested in why individuals who cannot sing put themselves through the ritual humiliation of an *X Factor* audition. There would be other researchers studying *X Factor* contestants who cannot sing. Imagine these researchers discovered that:

- those who cannot sing don't notice when they blush or sweat
- those who cannot sing think they are great dancers even when it is clear to others that they cannot dance
- those who cannot sing think they are attractive even when the majority of viewers would think they are not.

This is even worse news for our theory: if they were simply tone deaf then this shouldn't affect their perception of their dancing, or physical attractiveness. All in all, it's looking pretty bad for our theory: it cannot explain all of the data, predictions from the theory are not supported by subsequent data, and it cannot explain other research findings.

At this point, a rival scientist, Dr Knowitall, comes up with an alternative theory to ours. She suggested that perhaps the contestants who cannot sing have a general attention deficit towards themselves (put another way, their attention is externally focused rather than focused on themselves). One prediction from her model is that if people are confronted by information about themselves and information about other people at the same time, then they will be more likely to pay attention to the information about the other person. To test this, Dr Knowitall showed the contestants who couldn't sing two pictures on a screen (one on the left and one on the right). One of the pictures was always a picture of themselves and the other was always a picture of someone else. She measured which of the two pictures the person's eyes moved towards. She found that the people who couldn't sing did tend to look at the pictures of other people. This supports her theory that these people do not pay attention to themselves. Dr Knowitall's theory is quite good then: it explains the initial observations, brings together a range of research findings, and also has obvious implications. One implication is that if these people don't pay attention to what they themselves do or say then they might accidentally leave the house one day without any trousers on, they'd offend their neighbours and probably get arrested. The end result of this whole process is that we should be able to make a general statement about the state of the world. In this case we could state '*X Factor* contestants who cannot sing find it difficult to pay attention to themselves'.

You may not realise it but in just a couple of pages we have just described the process that underlies all of science. We begin with an observation that we want to understand, we generate theories (explanations) of those observations, hypotheses (predictions) are generated from these theories, we test these hypotheses, and the data we collect may support our theory or give us cause to modify the theory. The processes of data collection (research) and generating theories are intrinsically linked: theories lead to data collection and data collection informs theories!

Photo 36.1 "Did I put my trousers on this morning . . . ?'

In describing this process we've also seen that a good theory should:

- explain the existing data
- explain a range of related observations
- allow statements to be made about the state of the world
- allow predictions about the future
- have implications.

In these respects, Dr Knowitall's theory is good: it explains the original observation, ties together a range of other related observations, allows predictions about the future, and has implications. Conversely, our theory is of little use: although it explains the original observation, its predictions weren't true, it cannot explain the other related evidence, and it doesn't really have any implications.

Testing theories

When is a hypothesis not a hypothesis?

We've seen what a theory is, and we've also seen that theories need to be tested. One important point from the previous section is that a good theory should allow us to make statements about the state of the world. However, there is a distinction between scientific and non-scientific statements. Scientific statements are ones that can be verified with reference to empirical evidence, whereas

CLASS ACTIVITY BOX 36.1

Understanding the research process

Get into small groups in class and let's do some very simple exercises to show how research works.

1. **Generate a hypothesis**: first, let's generate a hypothesis. For this exercise, the hypothesis can be anything you like providing it's something you'll be able to ask your classmates about without blushing too much (probably not 'does size matter?' then . . .). So it could be something like 'The last Harry Potter book was better than the previous one' or 'Vodka tastes nicer than Tuaca'. Use your imagination to think of a hypothesis that you would like to test.
2. **Collect some data**: once you have agreed on a hypothesis to test, collect some data. To keep things simple, why not just ask your classmates to put up their hands in response to your question, and then count the number of hands. So, you could ask people to put up their hands if they read the last two Harry Potter books (not everyone will have), and then ask them to keep their hands up if they thought the last one was better than the previous one. You will now have some data. For example, you might find that 21 people read the last two Harry Potter books, and of those 17 thought the final one was the better of the two.
3. **Interpret the data**: now, as a group, decide whether your data support your hypothesis: did more people prefer the final book? Do more people prefer the taste of Vodka?
4. **Create a theory**: you now have the basis of a theory. You know, for example, that people preferred the last Harry Potter book, but you don't know why they did. Now try to create a theory. Why do you think that they preferred the final book? Was it more exciting? Was the storyline better? In your groups, agree on a theory to be tested.
5. **Test the theory**: you can now collect more data. Let's say that your theory is that the last Harry Potter book was better because it was more exciting. You could test this with qualitative methods (you could get people to discuss the two books and analyse these discussions to see if people mention excitement more in the context of the final book than the penultimate one). You could also use quantitative methods: you could ask people to rate the two books from 0 – completely boring, to 10 – the most exciting book I have ever read. Are the ratings generally higher for the last book?
6. **Modify your theory**: do the data support your theory? Was the last book more exciting? If not, what other theory might you generate to explain your original finding that people preferred the final book?

non-scientific statements are ones that cannot be empirically tested. So, statements such as 'The new Mika album is a load of rubbish', 'Chocolate is the best food' and 'This is the best introduction to a psychology book in the world' are all non-scientific; they cannot be proved or disproved. On the other hand, scientific statements can be confirmed or disconfirmed empirically. 'Listening to Shayne Ward makes adolescent women want to marry him', 'drinking water from the local pond makes you vomit' and 'prolonged use of amphetamines makes you psychotic' are all things that can be tested empirically (provided you can quantify and measure the variables concerned). Non-scientific statements can sometimes be altered to become scientific statements, so, 'chocolate is the best food' is non-scientific but by changing the statement to 'chocolate is the best food for improving your mood' it becomes testable (we can collect data about the change in mood resulting from different foods and prove or disprove the statement). Karl Popper, the famous philosopher of science, believed that non-scientific statements were nonsense, and had no place in science. Good theories should, therefore, produce hypotheses that are scientific statements.

Self-test: Think of a non-scientific statement reflecting one of your interests (e.g. 'Iron Maiden are the best band in the world'). Turn this statement into a scientific one (e.g. 'Iron Maiden sell more records than Madonna'). Think of a way to test your statement (e.g. you could get data on record sales for the two artists).

Types of hypothesis

So far we've seen that good theories should allow us to generate scientific statements. These statements should lead to hypotheses. Hypotheses are testable statements derived from a theory and any hypothesis has two forms. The experimental hypothesis (aka the alternative hypothesis) is denoted by H_1 and is the prediction that comes from your theory. The null hypothesis, denoted by H_0, is simply the opposite. Taking our *X Factor* example, one hypothesis from our theory was as follows.

- Experimental hypothesis: contestants who cannot sing think that they are better singers than other people.

The null hypothesis is simply the opposite:

- Null hypothesis: contestants who cannot sing do not think that they are better singers than other people.

This is all very well but why do we actually care about the null hypothesis? The reason we care is because we cannot actually prove the experimental hypothesis, but we can disprove the null hypothesis. If our data give us confidence to reject the null hypothesis then this provides support for our experimental hypothesis. However, be aware that even if we can reject the null hypothesis, this doesn't prove the experimental hypothesis it merely supports it. Just to make life even harder, we cannot ever really say anything definite about either hypothesis, all we can ever do is draw vague conclusions based on collecting data. So, rather than talking about accepting or rejecting a hypothesis (which some textbooks tell you to do) we should be talking about 'the chances of obtaining the data we've collected assuming that the null hypothesis is true'.

Using our *X Factor* example, when we collected data from the contestants who couldn't sing, we found that 80% of them thought they were good singers. So, when we analyse our data what we are really asking is 'Assuming that contestants who cannot sing *do* realise that they cannot sing, is it likely that in the group we tested 80% would tell me that they think they are good singers?' Intuitively the answer is that the chances are very low: if the null hypothesis is true, then most people in the group we tested should realise that they are bad singers and so would not report that they are good singers. Therefore, I'm very unlikely to have got the data that we did if the null hypothesis were true. What if we would found that only 10% reported that they thought they were good singers? Clearly if the null hypothesis is true, and contestants who cannot sing do realise they are bad singers then only a small number would be expected to think that they are good singers. The chances of getting these data are, therefore, high.

When we collect data to test theories we have to work in these terms: we cannot talk about the null hypothesis being true or the experimental hypothesis being true, we can only talk in terms of the probability of obtaining a particular set of data if, hypothetically speaking, the null hypothesis was true.

Another distinction that we make with hypotheses is whether they are one- or two-tailed. A one-tailed hypothesis states that an effect will occur but it also states the direction of the effect. For example, 'women are cleverer than men' is a one-tailed hypothesis because it states the direction of the effect (women are more intelligent than men). A two-tailed hypothesis states that an effect will occur but it doesn't state the direction of the effect. For example, 'women and men differ in their intelligence' does not tell us whether men or women are cleverer, just that they differ. This is a two-tailed hypothesis.

Self-test: If my null hypothesis is 'there is no difference between cats' and dogs' sense of smell', what would be an appropriate 'alternative hypothesis'?

Measuring things

Variables

To test hypotheses we need to measure variables. *Variables* are just things that can change (or vary); they might vary between people (e.g. IQ) or vary across time (e.g. mood). Most hypotheses can be expressed in terms of two variables: a proposed cause and a proposed outcome. Let's take one of our previous statements, 'prolonged use of amphetamines makes you psychotic'. In this case, the proposed cause is 'prolonged amphetamine use' and the proposed effect is becoming psychotic. Both the cause and the outcome are variables: for the cause people will vary in the amount of amphetamines they have used, and for the outcome, people will also have different levels of psychoticism.

The key to testing such statements is to measure these variables. In psychology particularly we can rarely directly measure variables and instead rely on indirect measures such as self-report, questionnaires, and computerised tasks (to name a few).

Why is it so important that we measure things? Well, imagine you were a psychopharmacologist and you wanted to show that amphetamine use does make you psychotic. You force-feed ten people with amphetamines over a six-month period and lo and behold after six months they start hallucinating (but see the section on ethics in Chapter 37). These results were written up and published for others to read. A few years pass and another scientist, Dr L. Dopa, comes along and shows that when he gave people amphetamines over six months they were not psychotic. Why could this be? There are two measurement-related issues here.

1. Dr L. Dopa might have fed his participants fewer amphetamines than you did (it may be that psychotic states depend on a certain critical mass of speed).
2. Dr L. Dopa might have measured the outcome differently – did you and Dopa assess 'psychotic states' in the same way?

The former point explains why chemists and physicists have devoted many hours to developing standard units of measurement. If you had reported that you'd fed your participants 100 grams of amphetamines per day, then Dr Dopa could have ensured that he had used the same amount – because grams are a standard unit of measurement we would know that you and Dopa used the same amount of the chemical. Direct measurements such as the gram provide an objective standard: an object that weighs 10 g is known to be twice as heavy as an object weighing only 5 g.

Levels of measurement

Although scales of measurement can be developed for properties that can be directly observed (such as height, mass and volume), we mentioned before that in psychology we usually have to take indirect measures. For example, to measure psychoticism we might use a questionnaire that asks people to report the frequency of various symptoms that we associate with psychotic states (such as delusions, hallucinations, paranoia and so on). This might give us a number from 0 (not psychotic) to 100 (completely psychotic). Could we claim that someone who scores 60 is, in reality, twice as psychotic as someone who scores 30? Probably not, however, we might be able to claim that someone scoring 60 was more anxious (to whatever degree) than someone scoring 30. This relationship between what is being measured and the numbers obtained on a scale is known as the level of measurement.

Thinking back to the reasons why Dr L. Dopa's results differed from yours, the second proposed explanation was that you and Dr Dopa measured the outcome differently. In both cases the observed outcome was 'psychotic states'. What constitutes psychoticism? Do you have to have the odd grandiose idea, or do you constantly have to spend all day thinking that you've just invented the solution to the world's energy problems (or something similarly grand). Perhaps you measured only hallucinations in your experiments whereas Dr Dopa was more inclusive and required delusions and paranoia as well. These differences in how you measured your outcome can affect the results you get. An inability to directly measure what we want to is a problem psychologists face all of the time. When we cannot measure something directly there will always be a discrepancy between the numbers we use to represent the thing we're measuring and the actual value of the thing we're measuring (i.e. the value we would get if we could measure it directly). This discrepancy is known as measurement error.

As we have already mentioned, there are different levels at which variables can be measured. Nominal data are measured on a scale on which two things that are equivalent in some sense are given the same name (or number). With this scale, there is no relationship between the size of the number and what is being measured; all that you can tell is that two things with the same number are equivalent whereas two things with different numbers are not equivalent. One example is the numbers that players in a rugby or football team wear. A rugby player with number 10 (e.g. England's Jonny Wilkinson) on his back is the fly half, whereas a player with number 1 on his back is the hooker (the nasty-looking player at the front of the scrum!). However, a number 10 player is not necessarily better than a number 1 (most managers would not want their fly half stuck in the front of the scrum!). The numbers on the back of shirts could equally well be letters or names (in fact, until recently many rugby clubs denoted team positions with letters on the back of shirts).

It's meaningless to do arithmetic on data from a nominal scale. For example, imagine if the England coach found that Jonny Wilkinson (his number 10) was injured. Would he consider replacing him with his number 4 (Simon Shaw) and 6 (Martin Corry)? The answer is no, not unless he wanted all of his penalty kicks to be missed! The only way that nominal data can be used is to consider frequencies. For example, we could look at how frequently number 10s score tries compared with number 4s.

Ordinal data tell us not only that things have occurred, but also the order in which they occurred. However, these data tell us nothing about the differences between values. Imagine you went to a 'ghostly' horse race in which there were three horses: Red Rum, Desert Orchid and Shergar. The names of horses don't give us any information about where they came in the race, however labelling them according to their performance does – first, second and third. These categories are *ordered*. In using ordered categories we now know that the horse that came first was better than the horse that came second. However, we still know nothing about the differences between categories; we don't know how much better the winner was than the horses that came second and third: it might have crossed the line 100 metres in front of the other horses or only 1 cm in front of them. Nominal and ordinal scales don't tell us anything about the differences between points on the scale.

A lot of psychological data, especially questionnaire and self-report data, are ordinal. Imagine you were asked to rate how bored you were by reading this chapter on a 10-point scale. We might be confident that a reader who gives a rating of 10 was more bored than one who gave a rating of 1, but can we be certain that the first reader was ten times as bored as the second? What about if both readers gave a rating of 10, even then, could we be sure they were equally as bored? Probably not: their ratings will depend on their subjective feelings about what constitutes boredom. For these reasons, in any situation in which we ask people to rate something subjective (e.g. rate their confidence about an answer they have given, rate how anxious they feel, or rate how popular they are) we should regard these data as ordinal, although many psychologists do not.

Interval data are considerably more useful than ordinal data and most of the statistical tests we use in psychology rely on having these data. To say that data are interval, we must be certain that equal intervals on the scale represent equal differences in the property being measured. Imagine a psychologist took several spider phobic individuals, and asked them to place a tarantula down their trousers and then rate their anxiety on a 10-point scale. For this scale to be interval it must be the case that the difference between anxiety ratings of 3 and 4 is the same as the difference between say 1 and 2, or 9 and 10. Similarly, the difference in anxiety between ratings of 2 and 5 should be identical to the difference between ratings of 5 and 8. If we had four phobic individuals (with their anxiety ratings in brackets): Graham (10), Andy (9), Leonora (2) and Benie (3), an interval scale would mean that the extra anxiety that Benie subjectively experiences compared to Leonora is equal to the extra anxiety that Graham experiences compared with Andy.

Ratio data go a step further than interval data by requiring that in addition to the scale meeting the requirements of interval the ratios of values along the scale should be meaningful. A good example of a ratio measure that's used in psychology is reaction times (i.e. the time to respond to something). When we measure a reaction time not only is it true that, say, the difference between 300 and 350 ms (a difference of 50 ms) is the same as the difference between 210 and 260 ms or 422 and 472 ms, it is also true that distances along the scale are divisible: a reaction time of 200 ms is twice as long as a reaction time of 100 ms and twice as short as a reaction time of 400 ms.

Self-test: I get participants to rate their mood on a line marked from 0 (calm) to 100 (angry) in spaces of 5. What level of measurement have I used?

A final property of variables is that they can be discrete or continuous. A discrete variable is one for which no underlying continuum exists; in other words, the measure classifies items into non-overlapping categories. One example would be being dead: a person can be only dead or alive. A continuous variable does have an underlying continuum. For example, intelligence runs along some kind of continuum (from village idiot at one end to Einstein at the other). The distinction between discrete and continuous variables can be very blurred. Gender, for example, seems like a discrete variable (you can be only male or female), however, there are genetic males who feel female, and vice versa; also, there are also chromosomal disorders that can confuse the genetic gender of a person. Continuous variables can be measured in discrete terms; for example, although depression is probably a continuous variable, clinicians tend to make a distinction between clinically depressed people and non-clinically depressed people.

Validity

So far we've seen that it's important to measure things in research, and that we should try to measure things as accurately as possible. There are two properties that a measure should have if it is to be accurate: validity and reliability. A good measurement instrument should measure what you designed it to measure and this is called validity. So, an intelligence questionnaire that actually measures aggressiveness is not valid, however, an intelligence questionnaire that does seem to equate with how clever people are is valid. Things like reaction times and physiological measures are valid in one sense because a reaction time does in fact measure the time taken to react and skin conductance does measure the conductivity of your skin. However, if we're using these things to infer psychological states (for example using skin conductance to measure anxiety) then they will be valid only if there are no other factors other than the one you are interested in that can influence them. If you choose a self-report measure there are different flavours of validity to consider.

The items in your self-report measure/questionnaire must relate to the construct being measured (content validity). Content validity is really the degree to which your items are representative of the construct being measured, so ensure that questions cover the full range of the construct. Criterion validity is whether the questionnaire is measuring what it claims to measure. In an ideal world, you could assess this by relating scores on your measure to real-world observations. For example, if you developed the 'attitudes about our own singing' questionnaire, you could give people the questionnaire and then see whether they can actually sing. This is often impractical and, of course, with attitudes you may not be interested in the reality so much as the person's perception of reality (you might not care whether they can actually sing, you might only care whether they think they can).

Reliability

Validity is a necessary but not sufficient condition of a self-report measure. A second consideration is reliability, which is the ability of the measure to produce the same results under the same conditions. To be reliable the questionnaire must first be valid. The easiest way to assess reliability is to test the same group of people twice: a reliable questionnaire will produce similar scores at both points in time (test-retest reliability). In reality, if we did test the same people twice then people might remember their responses from last time and give the same ones (or different if they are trying to mess up your research!) and this will bias your assessment of reliability. Also, imagine you're trying to measure something like depression. Obviously, depression will fluctuate over time so you'd want your measure to be sensitive to these changes and *not* produce the same scores!

Sometimes people use a statistical technique called split-half reliability. You simply randomly split questions on your measure into two groups and then compare participant's scores on the two halves: the scores should be roughly the same. A more sophisticated version of this technique is to not just split the items in half once, but to split the measure into two halves in all possible ways. You can then compare people's scores on the two halves for all of the different splits and compute an average split half reliability score known as Cronbach's alpha. For psychological measures, if Cronbach's alpha is above about 0.7 then you're doing pretty well.

Self-test: What is the difference between reliability and validity?

Measurement error

On page 544 we came across the concept of measurement error, which is the difference between the scores on our measurement scale and the level of the construct we're measuring. For example, imagine you know as an absolute

CLASS ACTIVITY BOX 36.2

Hypotheses

Listed below are some popular theories in psychology. For each one try to generate a hypothesis that might arise from the theory. For each hypothesis, state the null hypothesis and say whether it is a one-tailed or two-tailed hypothesis.

1. Galton suggested that intelligence is hereditary (runs in families) – see Chapter 30.
2. Bandura suggested that people learn their behaviours from watching others (observational learning) – see Chapter 17.
3. Pavio et al. (1968) suggested that things are easier to remember if you visualise them.
4. Piaget suggested that children develop logical thinking skills as they get older – see Chapter 18.

Some possible answers

1. One hypothesis would be 'People with intelligent parents will be more intelligent than those with stupid parents'. This is a one-tailed hypothesis because we've stated that people with intelligent parents will be *more* intelligent. The null hypothesis would be that 'people with intelligent parents will have the same intelligence as those with stupid parents'.
2. One hypothesis would be 'The more violent films a person watches, the more aggressively they behave'. This is a one-tailed hypothesis because we've stated that watching violent films increases aggressive behaviour. The null hypothesis would be that 'Aggressive behaviour is not influenced by watching violent films'.
3. One hypothesis would be 'There will be a difference between the number of words remembered by people who read a list of words and are asked to visualise each word and people just asked to read the list of words'. This is a two-tailed hypothesis because we've just stated that there will be a difference and not what that difference is. The null hypothesis would be that 'There will not be a difference between the number of words remembered by people who read a list of words and are asked to visualise each word and people just asked to read the list of words'.
4. One hypothesis would be 'Older children can solve logical problems better than younger children'. This is a one-tailed hypothesis because we've stated that older children will be *better* at logical tasks than younger ones. The null hypothesis would be that 'Older children and younger children will not differ in their ability to solve logical problems'.

truth that you weigh 73 kg. One day you step on the bathroom scales and it says 75 kg. There is a difference of 2 kg between your actual weight and the weight given by your measurement tool (the scales): there is a measurement error of 2 kg. Although properly calibrated bathroom scales should not produce a measurement error (despite what we might want to believe when they've just told us we're really heavy!), self-report measures like the ones used in many psychology experiments do produce measurement error because they are an indirect way of tapping the construct we're trying to measure.

One reason (of many) why is because other factors will influence how people respond to our measures. Imagine you were completing a questionnaire about your 'intrusive thoughts' (see Chapter 34), would you want to admit to thinking about harming someone, or drowning puppies or something? Probably not, you'd want to keep your strange ideations to yourself! Also, people's responses can be influenced by what they think the person testing them wants them to do: this is known as a demand characteristic.

Causes vs correlations

So far we've learnt that psychologists are interested in answering questions, and that to answer these questions they have to collect data, then generate theories, which in turn generate hypotheses, which then have to be tested. We've also learnt that to test a hypothesis we need to measure variables. If we simplify things a bit then there's basically two ways to test a hypothesis: either by observing what naturally happens, or by manipulating some aspect of the environment and observing the effect it has on the variable that interests us. The main distinction between what might be termed correlational or cross-sectional research (where we observe what naturally goes on in the world without directly interfering with it) and experimental research (where we manipulate one variable to see its effect on another) is that experimentation involves the direct manipulation of variables. In correlational research we do things like observe natural events (e.g. aggressive behaviour of children in a playground) or we take a snapshot of many variables at a single point in time (e.g. such as administering several questionnaires about sexual practices). Correlational research provides a very natural view of the question we're researching because we are not influencing what happens and the measures of the variables should not be biased by the researcher being there (this is an important aspect of ecological validity). Imagine you wanted to answer the question 'what factors affect condom use in teenagers?' We could administer questionnaires about sexual practices (such as condom use, previous condom use, number of sexual partners, perceptions of risk of unsafe sex, etc.). By looking at these variables we could see which variables predict condom use (which has obvious important implications). This is the only real way to answer this question because we cannot really manipulate any of these variables particularly easily: although we might be able to change perceptions of risk to unsafe sex, ethical considerations would probably prevent us from encouraging people to acquire more sexual partners for the benefit of our research! However, there is a price to pay, which relates to causality.

Cause and effect

Psychologists are interested in answering questions: 'Does drinking cause memory loss?', 'Is sexual impotence all in the mind?', or maybe 'does stress trigger depression?' Research questions such as these often imply a causal link between variables. Sometimes this could be in a direct statement such as 'does drinking cause memory loss?' Sometimes the implication might be subtler, such as 'is sexual impotence all in the mind?' The implication is that a person's mental outlook causes them to be sexually impotent. Many research questions can be broken down into a proposed cause (in this case mental outlook) and a proposed outcome (poor sexual performance). Both the cause and the outcome are variables: for the cause some people will worry about their sexual performance whereas others won't (so it is something that varies), and for the outcome, well, some people will be able to perform sexually and others won't (again, this is something that varies). The key to answering the research question is to uncover how the proposed cause and the proposed outcome relate to each other; is it the case that the people who worry about their performance are the same people who cannot perform?

Early philosophers, such as David Hume (1748, 1739–40), said that to infer cause and effect: (1) cause and effect must occur close together in time (contiguity); (2) the cause must occur before an effect does; and (3) the effect should never occur without the presence of the cause. These conditions imply that causality can be inferred through corroborating evidence: cause is equated to high degrees of correlation between contiguous events. In our impotence example, to infer that worry caused impotence, it would be sufficient to find that whenever someone worried about their performance they would be impotent, that the worry should precede the impotence, and that the person should never be impotent if they haven't just been worrying about it! Already we can begin to see one fundamental problem with correlational evidence: the variables are measured *at the same time*. That is we get no information about the contiguity between different variables: we might find from a questionnaire study that people who worry a lot about impotence do tend to be impotent, but we would know nothing about whether that worry precedes the impotence!

Let's imagine that we also find that sometimes a person worries about their sexual performance but does not become impotent. This doesn't violate any of Hume's rules: he doesn't say anything about the cause happening without the effect! It could be that both worry about sexual performance and impotence are caused by a third variable (for example the behaviour of their partner, which might quite reasonably mediate how anxious the person feels and whether they rise to the occasion). This illustrates a second problem with correlational evidence: the tertium quid ('a third person or thing of indeterminate character'). Field and Hole (2003) use the example of how you might observe a strong correlation between having dreadlocks and supporting environmental issues. However, it is unlikely that having dreadlocks causes an interest in the environment – presumably, there is an external factor (or factors) that causes both. These extraneous factors are sometimes called *confounding variables* or confounds for short.

The shortcomings of Hume's criteria led John Stuart Mill to suggest that to infer cause not only should cause precede effect and should cause and effect correlate (as Hume had said) but that all other explanations of the cause–effect relationship must be ruled out. Put simply, confounding variables should be ruled out. To rule out confounding variables Mill proposed that an effect should be present when the cause is present *and* when the cause is absent the effect should be absent also. Field and Hole (2003) sum up Mill's ideas by saying that the only way to infer causality is through comparison of two controlled situations: one in which the cause is present and one in which the cause is absent. These situations should be identical in all senses except the presence of cause. We'll come back to these ideas in the next chapter when we look at different methods for collecting data, for now, just bear in mind the conditions necessary to draw conclusions about causes of effects.

Two important variables

We've seen that most research questions can be broken down into cause and effect. We've also seen that it's important to measure things when we do research. It will come as no surprise then that to answer research questions we need to measure the proposed cause and the proposed effect. Any variables that we think are a cause are known as independent variables (because their value does not depend on any other variables) and these are the variables that are manipulated in experiments. Any variable that we think is an effect is known as a dependent variable (because the value of this variable depends on the independent variable or cause). These terms are very closely tied to experimental methods. In cross-sectional research we don't manipulate any variables and we cannot make causal statements about the relationships between variables and so it doesn't make sense to talk of dependent and independent variables because all variables are dependent variables in a sense. One possibility is to abandon the terms dependent and independent variable and use the terms predictor variable and outcome variable. In experimental work the cause, or independent variable, is a predictor, and the effect, or dependent variable, is simply an outcome. This terminology also suits cross-sectional work where, statistically at least, we can use one or more variables to make predictions about the other(s) without needing to imply causality.

Self-test: What is the difference between a dependent and an independent variable?

Testing theories with numbers

Once we've come up with a theory and collected some data by measuring some variables, we need some way to assess whether the theory is supported or not. One approach is to use mathematics to help us out with this task (quantitative research). In fact, Britain can be very proud of the fact that it produced arguably the two most important figures in modern statistics: Ronald Fisher and Karl Pearson. These two men (both of whom worked at University College London, although not at the same time) are largely responsible for the statistical techniques that psychologists use. There's also an extremely interesting history between the two men who, on the face of it, hated each other! Pearson was the elder and a famous statistician when Fisher was a young academic. Fisher published a paper that Pearson publicly criticised (based on some misunderstandings of Fisher's work) without informing Fisher. Pearson subsequently ignored Fisher's re-explanation of his work, and to add insult to injury some of Fisher's papers were withdrawn from the Royal Society (an extremely important forum for this kind of work) because they corrected some errors in Pearson's work and Pearson was revered at the time within this society. The hostility between the men was such that Fisher refused Pearson's offer of a job at University College London, and accepted the post only after Pearson retired. Who said statistics is dull?

The easiest way to illustrate how we use statistics to tell us whether our data support our theories is to use an example that Fisher (1925) describes. Fisher wanted to test a female friend's claim that she could determine, by tasting a cup of tea, whether the milk or the tea was added first to the cup. Fisher reasoned that, if this claim were true, then if he gave the lady some cups of tea, some of which had the milk added first and some of which had the milk added last, she should be able to correctly distinguish the cups. In all cases, all the lady knows is that there are an equal number of cups in which milk was added first or last. Imagine first that there are only two cups; the lady has 50% chance of guessing correctly. Would this be sufficient to convince Fisher that she had the talents that she claimed to have? Probably not: you could perform well on this task just by guessing. However, if we had four cups (two with milk added first and two with milk added last) then there are six different orders in which these cups can be arranged. If the lady got the order correct then she could do this by guessing only one in six times. Therefore, our confidence in her talent should increase. If we used six cups, there are 20 orders in which these can be arranged and the lady would guess the correct order only 1 time in 20 (or 5% of the time). If she got the correct order then we would be very confident that she could genuinely tell the difference.

These principles underlie science: we draw inferences about theories based on confidence about a given set of data. If it's very unlikely that we would get a particular set of data if our hypothesis is untrue, then we become more confident that our hypothesis is true. Fisher actually suggested that an appropriate level of confidence is 0.95 (95%), so that if the probability of our results being due to chance is less than 0.05 (5% or 1 in 20 – just as in the six cups example) then we should conclude that a result is genuine. This example lays the foundations of the statistical ideas presented in Chapter 41. It is worth remembering, however, that this value is completely arbitrary, even though some psychologists use it as if it has some kind of magical power. The truth is that Fisher could just have easily decided that 0.1 was a suitable criterion, or 0.01, if he'd woken up in a different mood on that fateful morning!

One question we haven't yet answered is how we know whether it's likely or unlikely that we would get the data we have if our hypothesis is untrue. Well, put simply, we fit a statistical model to the data and see whether it fits the data well. This is best explained by analogy. Field (2009) likens statistics to an engineer wishing to build a bridge across a river. An engineer doesn't just go out one morning with a pile of bricks and steel and build whatever bridge she happens to feel like, because it would probably fall down. Instead, she looks at bridges in the real world and sees what materials they are made from, what structures they use and so on (she might even collect data about whether these bridges are still standing!). This information is used to construct a model: She builds a scaled-down version of the real-world bridge. The engineer will try to build a model that best fits the situation of interest based on the data available. Once the model has been built, it is used to predict things about the real world: for example, its strength might be tested by placing weights along it. Obviously it's vital that the model is an accurate representation of the real world. Psychologists do much the same thing: we build statistical models of real-world psychological processes based on our theories. We then test these models by collecting data. Unlike engineers we don't have access to the real-world situation and so we can only ever infer things about psychological processes based upon the models we build. For our inferences to be accurate the statistical model we build must accurately represent the data collected (the observed data). The degree to which a statistical model represents the data collected is known as the fit of the model. If our statistical model fits our data

Letís see if her pee is less than 0.05.....
Can I stop drinking tea now Dr. Fisher?

Figure 36.1 Fisher's 'tea test'

well, and this model is based on our original theory, then it's likely that the initial theory was correct.

Testing theories without numbers

An alternative to reducing psychological processes to statistical models is to attempt to extrapolate support for a theory from what people say or write (qualitative research). Describing qualitative research is not easy; the term has tended to be associated with the researcher being more interested in meanings and contexts rather than the precision and control associated with quantitative research. This has also led to rather unhelpful attributions (in some people) of quantitative research being 'better' because of its association with strict control of variables and causal inference. Of course, the reality is that both methodologies have their strengths and their weaknesses. Hammersley (1992) distinguished qualitative and quantitative research in terms of seven components (see Table 36.1).

Some people would disagree with Hammersley on almost all of these points; for example, quantitative data are not always collected in strictly controlled laboratory settings, conversely qualitative data can be collected in a reasonably controlled manner. It is also the case that many psychologists who use qualitative data would object to the implications that they are not interested in human behaviour or trying to uncover scientific laws! The important point is not to get bogged down in these debates but just to see these methodologies as two different approaches to understanding human behaviour.

TABLE 36.1

	Qualitative	**Quantitative**
Data	Qualitative	Quantitative
Setting	Natural	Artificial (laboratory)
Focus	Meanings	Behaviour
Model	Holistic	Philosophy of science
Approach	Inductive	Deductive
Aim	Uncover cultural patterns	Uncover scientific laws
Basis	Idealism	Realism

The wealth of qualitative approaches cannot be summarised adequately here: we can provide only a flavour. One popular method that illustrates qualitative analysis generally is discourse analysis. Discourse analysis operates on the basic assumption that by studying what we say (and how we interact) we can gain access to psychological processes. For example, if we say 'we are depressed', our expression of depression is not just based on some internal experience that only we have access to, the label of 'depression' that we have attached to how we feel at that moment is socially constructed: we have used that label because we have observed how others have used the label. Discourse analysts are interested in what people are doing when they say things and the functions of statements that people make. So, us declaring that 'we are depressed' should be taken within the context of our social environment (perhaps we are just trying to elicit sympathy, perhaps we are crying out for help). By studying these interactions we can learn a lot about how the social world is constructed and also about how psychological processes manifest themselves in the real world.

The starting point for a discourse analysis could be an individual interview (which has an advantage of control) or a group discussion (which has the advantage that you can look at natural interactions). These discussions would then be transcribed. The first thing to realise is that not all of the material will be analysed, but instead, topics or themes are identified, often through reading the material and looking for re-occurring features of conversation, or intuition about important parts of the dialog. You would then begin to index the transcripts according to the themes identified. You should re-read the material to try to find counter-examples of things you've identified (this is especially important if you're working on intuitions). The analysis itself is based on writing an account of the themes you've identified or the intuitions you're following, and extracting data from the transcripts to back up (or contradict) your ideas. The analysis should be iterative: you should re-assess your analysis and re-draft it as readings of the transcripts throw up new ideas and examples. Billig (1997) gives an excellent real-life example of the process.

There are of course other techniques, and the whole process can be both theory- or data-driven. In theory-driven analysis you analyse discourse or interactions with respect to existing theory. In data-driven analysis you collect data with no particular theory in mind and let the analysis inform the development of a theory (sometimes called Grounded Theory).

Self-test: What is the main difference between qualitative and quantitative research?

Summary

This chapter has shown us how theories and research are intrinsically linked, and tries tried to give you a flavour of the research process by explaining the various stages of psychological research (see Figure 36.2). You begin with an initial observation or research question that is probably informed by data. You then generate a hypothesis to explain this observation and in doing so identify variables that can be measured. You then collect data to test the theory (and measure the variables you previously identified). Finally you analyse these data (either by fitting a statistical model if we've collected numeric data, or through an analysis of text, discourse or interactions). The results should feed back into your theory by either supporting your ideas or, more often, provoking modification of your original theory. The modified theory is then tested (so you get stuck in this eternal loop of generating and testing theories until the day you die).

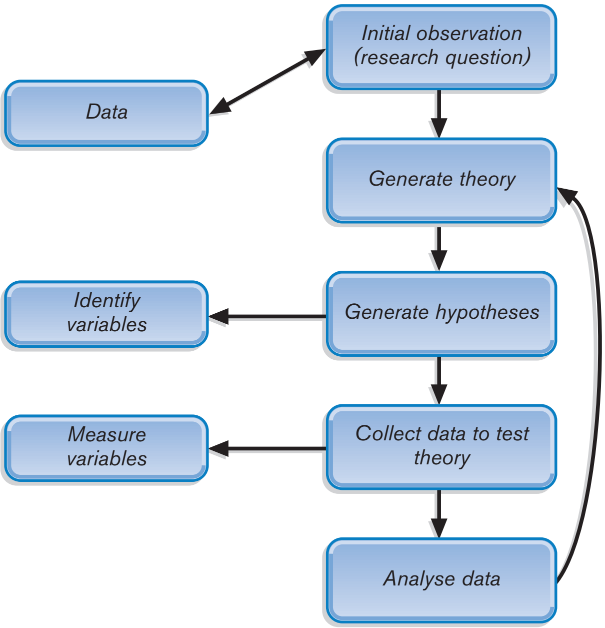

Figure 36.2 Summary of the research process

CLASS ACTIVITY BOX 36.3

Testing theories

'Little Miss Muffet sat on a tuffet, Eating her curds and whey. There came a big spider, He sat down beside her. And frightened Miss Muffet away!'

Thinking about what you've learnt in this chapter, how would you discover whether the spider really did scare Miss Muffet away? (That is, think about what your hypotheses would be, use what you know about cause and effect to suggest what you'd need to do to test these hypotheses, what variables you would measure, etc.)

Answer

Your theory is that 'spiders scare Miss Muffet'. The experimental hypothesis would be 'when Miss Muffet sees a spider, she runs away' and the null hypothesis would be 'when Miss Muffet sees a spider, she does not run away'.

Thinking about these in terms of a scientific statement, what is your cause and effect? Well, the cause is spiders, and the effect is running away. Therefore, these are your two variables: spiders are the independent variable (predictor) and 'running away' (well, anxiety really) is your dependent variable (outcome).

Thinking about what you know about isolating cause and effect (Hume and Mill) we would need to compare two situations: one in which cause is present and one in which cause is absent. Therefore, we need to have some instances where Miss Muffet sees a spider and some instances where she doesn't. This would be how we manipulate our predictor variable: we would make sure there were some occasions when a spider came and sat beside Miss Muffet, and some occasions where it didn't. If the spider causes anxiety then when the spider is there we would expect anxiety to go up, and when it's not there anxiety should be normal.

How would we measure anxiety? We could just see whether she ran away (yes or no) or perhaps go for something more sophisticated like measuring her heart rate, or her skin conductance (how much she's sweating), both of which are indicators of fear.

How would we gain confidence that our theory was correct? If we took many observations, and found that in general when the spider was there Miss Muffet was anxious and when it wasn't there she wasn't anxious, we could be fairly confident that the spider causes anxiety (although we would need to be careful to control the woodland environment to make sure there weren't any other creepy crawlies that appeared when the spider did!).

Knowing that the spider causes anxiety we can generate new research questions: why does the spider scare her? Is it because it's hairy? Is it because it sat beside her? (Would it be different if it stood?) Is it because it has eight legs?

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe why research is important in psychology.
2. Describe what a theory is and how hypotheses are generated.
3. Describe the reasons why we measure things, and critically assess the issues involved in measuring psychological variables.
4. Discuss the difference between a cause and a correlation.
5. Critically assess how data can be analysed with either quantitative or qualitative methods.

Further reading

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Essay titles and references

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2 How can we determine causal influences in research?

Cook, T. D. and Campbell, D. T. (1979) *Quasi-Experimentation*. Chicago: Rand-McNally.
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3 Are qualitative and quantitative research methods compatible?

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37

Collecting data

Route map

In the last chapter we saw the importance of collecting data to inform theories and to try to explain human behaviour. This chapter looks at how we conduct research. We begin by looking at a very important aspect of research: ethics. We overview some important issues to consider in conducting ethical research such as informing people about what you're doing, deceiving people, debriefing participants, confidentiality and the right to withdraw from the experiment. We then turn our attention to experimental designs. We learnt a bit about cause and effect in the previous chapter and we build on this to find out why control conditions and randomisation are important in experimental research. We then look at different ways to measure and manipulate variables and overview some commonly used experimental designs. We then turn our attention to non-experimental designs before considering how we actually find people to test.

Ethical considerations in research

As professionals, it is important that psychologists have a code of conduct that guides their everyday activities (including treatment, research, and interactions with other psychologists, the media, students, patients and members of the public). The purpose of a code of conduct is mainly to protect the people within our care (be they patients, students or participants in our research), but ethical guidelines also aim to ensure that we treat our colleagues in an appropriate manner. This section looks specifically at some ethical issues that need to be considered when conducting research.

The British Psychological Society (BPS) has a detailed code of conduct that covers all aspects of a psychologist's activities. In terms of research, the general guiding principle is that the consequences of the research should be considered from the standpoint of all participants; foreseeable threats to their psychological well-being, health, values or dignity should be eliminated. In a multi-cultured and multi-ethnic society and where investigations involve participants of different ages, gender and social background, the researcher may not have sufficient knowledge of the implications of any study – the best judge of whether an investigation will cause offence may be members of the population from which the participants in the study are to be drawn.

Participants should have confidence in the experimenter and mutual respect and confidence between the experimenter and the participants should be encouraged.

Self-test: Why do psychologists need a code of conduct?

Informed consent

Whenever possible, researchers should inform all participants of the objectives of the study and about all aspects of the research that might be expected to influence willingness to participate (this is known as informed consent). Should the participant enquire about any other aspect of the research the investigator should, normally, oblige. A related issue is that of deception (see page 554).

It is important to gain consent because researchers are often in a position of authority or influence over participants who may be their students, employees or clients. This relationship can be allowed to pressurise the participants to take part in, or remain in, an investigation that they find upsetting. Milgram's obedience to authority experiments (see Chapter 25) are a very good example of how people might be encouraged to do things they're uncomfortable with (like giving someone an electric shock) just because an experimenter is telling them to do so. Therefore, it's customary to use a consent form in which participants are informed about any aspect of the study that might influence their willingness to participate, they would then sign an agreement saying that they had understood what the study involved, understood that they were entitled to withdraw at any point (see below), and agree to take part.

Two obvious threats to consent are work with children, or with adults who have impairments that may compromise their understanding of the experimental procedures. If research involves any person under 16 years old, consent should be obtained from parents or from those *in loco parentis* (for example, teachers within a school). If the nature of the research precludes consent being obtained from parents or permission being obtained from teachers, the researcher must obtain approval from an ethics committee before commencing the study. Where real consent cannot be obtained from adults with impairments in understanding or communication, wherever possible the investigator should consult a person well-placed to appreciate the participant's reaction (e.g. a member of the person's family), and must obtain approval from independent advisors.

A final issue is paying participants for their participation. Payment can induce participants to risk harm beyond that which they would be prepared to risk without payment in their normal lifestyle. For example, someone who would not normally take drugs may be induced into taking them in a research context because of the financial rewards. Related to this point is that when research involves potential harm, unusual discomfort, or other negative consequences, the researcher must obtain the approval of independent advisors, inform the participants, and obtain informed, real consent from each of them.

Figure 37.1 shows an example of a consent form. Note that the information reveals all important aspects of the research without necessarily giving away the purpose of the research, and without boring the participant with a detailed account of the 'computer task' (because the task is a simple reaction time task that doesn't have any ethical implications). However, note that specific mention is made that the person will be weighed; this is important to mention because it might cause offence. Finally, note that specific mention is made of the fact that the participant can withdraw at any time, and also note that a code is assigned to the participant. On the actual consent form the participant signs to agree that they have had the opportunity to ask questions and have got satisfactory answers to any questions they have asked and that they have understood that they can withdraw at any point. The consent part of the form then needs to be detached so that the name of the participant cannot be connected to the code assigned to them.

Deception

Misleading participants is hugely problematic because it compromises their ability to make an informed choice about whether to participate (and of course it's not nice to lie to people!). The guiding rule in the BPS code of conduct is that withholding information or misleading participants is unacceptable unless there is extremely strong scientific or medical justification and is especially reprehensible if the participants are likely to object or show unease once debriefed. If this is the case, the BPS recommend that you consult individuals who share the social and cultural background of the participants in the research (to gauge their objection/unease at the deception), although the advice of ethics committees or experienced and uninvolved colleagues may be sufficient.

Nevertheless, the BPS respects the fact that sometimes it's impossible to study psychological processes without withholding information about the true object of the study or deliberately misleading the participants. They, therefore, suggest that before engaging in such a study the researcher should:

- ensure that alternative procedures avoiding concealment or deception are not available
- ensure that the participants are provided with sufficient information at the earliest stage
- consult appropriately upon the way that the withholding of information or deliberate deception will be received.

Debriefing

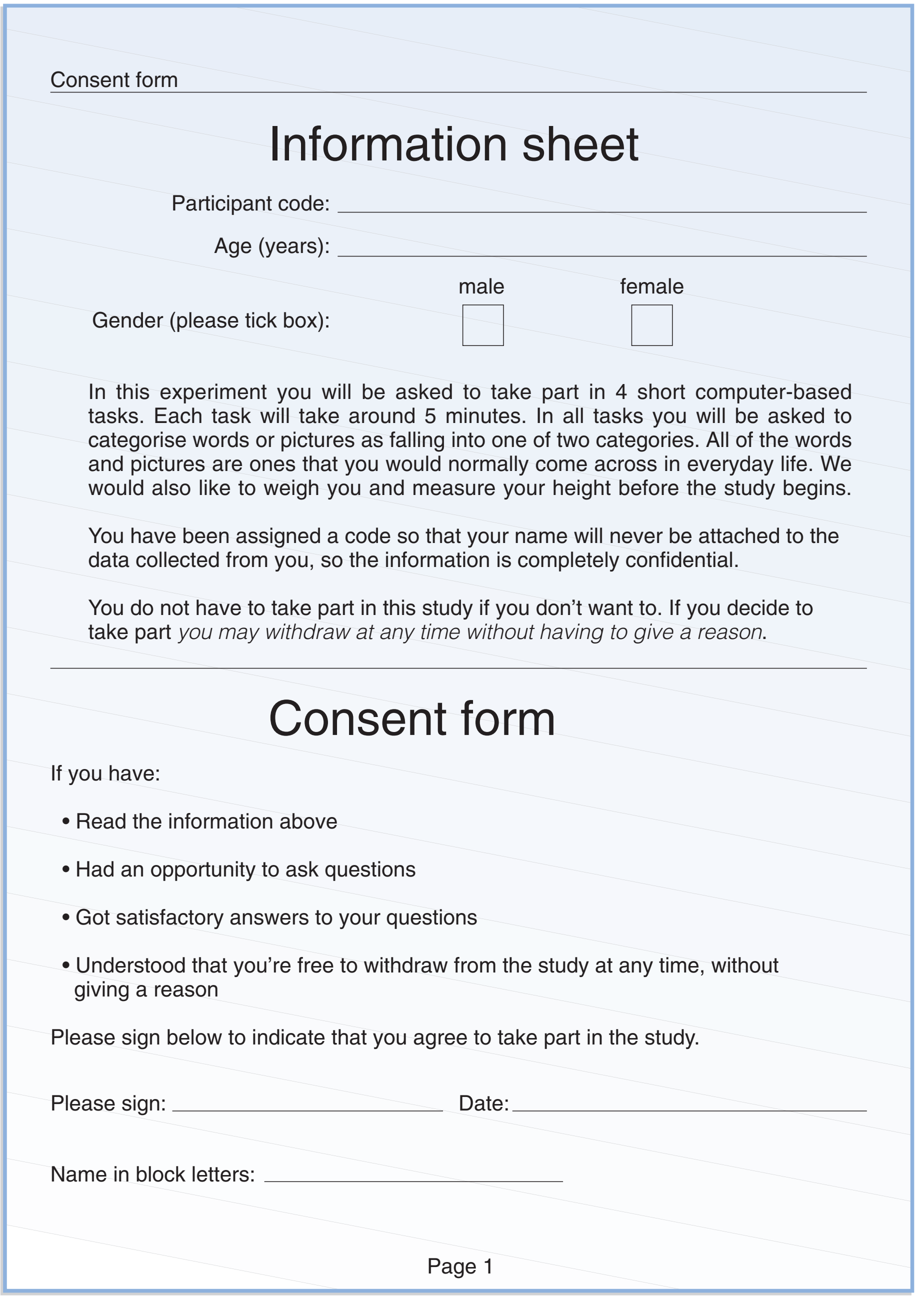
If participants are aware that they have taken part in an experiment it is only fair that the experimenter tells them something about what was done to them and why; the researcher should provide any necessary information to complete the participant's understanding of the nature of the study. In addition, the investigator should discuss the participant's experience of the study to monitor any unforeseen negative effects or misconceptions.

However, this isn't an excuse to be incredibly unethical or to deceive people (under the pretence that they'll find out the truth eventually), because some effects of an experiment cannot be negated by a verbal description following the research. The BPS therefore, encourages active intervention before participants leave the research setting.

Freedom to withdraw

You'll remember on our consent form (Figure 37.1) there was a phrase informing the participant that they were free to leave the experiment at any time. It is vital that this principle is upheld, even if money has been offered to participate. In fact, it's good practice to still pay people who withdraw (otherwise you're offering an inducement to stay doing a task that they would otherwise stop doing).

The right to withdraw can be difficult in observational or organisational settings, but nevertheless the investigator must attempt to ensure that participants (including children) know of their right to withdraw. There is an issue of how to tell if a child wants to withdraw. The BPS suggest that if a child tries to avoid the testing situation then this can be taken as evidence of failure to consent to the procedure. For example, Field and Lawson (2003) asked 7–9-year-old children to place their hands in a box that the children believed contained a animal about which they had been given threat information. There was no animal in the box, and the children were at no risk, but the experimenters wanted to know whether the threat information would make children slower to put their hand in the box. Field and Lawson placed a 15-second limit on the task: if the child did not put their hand in the box



Consent form

Information sheet

Participant code: ______________________

Age (years): ______________________

Gender (please tick box): male ☐ female ☐

In this experiment you will be asked to take part in 4 short computer-based tasks. Each task will take around 5 minutes. In all tasks you will be asked to categorise words or pictures as falling into one of two categories. All of the words and pictures are ones that you would normally come across in everyday life. We would also like to weigh you and measure your height before the study begins.

You have been assigned a code so that your name will never be attached to the data collected from you, so the information is completely confidential.

You do not have to take part in this study if you don't want to. If you decide to take part *you may withdraw at any time without having to give a reason*.

Consent form

If you have:

- Read the information above
- Had an opportunity to ask questions
- Got satisfactory answers to your questions
- Understood that you're free to withdraw from the study at any time, without giving a reason

Please sign below to indicate that you agree to take part in the study.

Please sign: ______________ Date: ______________

Name in block letters: ______________

Page 1

Figure 37.1 An example of a consent form

within this time, they assumed that they wanted to withdraw from the task. This procedure was specifically implemented so that children would not feel pressured to do the task, and because children might lack the confidence to tell an adult that they do not want to complete the task. Having done research with children I'm also encouraged by the fact some children at least are perfectly happy to tell you that they'd rather be doing something else!

A related issue is that having done an experiment, a participant has the right to withdraw retrospectively (resulting from their experiences or the debriefing). This withdrawal would mean them withdrawing their consent to you using their data (which should be destroyed).

Confidentiality

Legislation, including the Data Protection Act, means that information obtained about a participant during an experiment is confidential unless otherwise agreed in advance. Participants in psychological research have a right to expect that information they provide will be treated confidentially and, if published, will not be identifiable as theirs. Note that in the consent form (Figure 37.1) the participant is explicitly told that their data will remain confidential (you can explicitly say in consent forms that participants' data may be published but that if it is their confidentiality will be maintained). If confidentiality and/or anonymity cannot be guaranteed, the participant must be warned of this in advance of agreeing to participate.

Protection of participants

The primary responsibility of researchers is to protect participants from physical and mental harm during the study. The risk of harm should, ordinarily, be no greater than in everyday life. Where the risk of harm is greater than in ordinary life independent advice should be sought (see section on consent). Participants must be informed about factors in the procedure that might create a risk, such as pre-existing medical conditions, and must told any action that will help them avoid risk.

After the experiment, participants have the right to contact the experimenter regarding issues to do with their well-being. Procedures for contacting the investigator within a reasonable time period following participation should be made explicit and the situations in which contact is appropriate (i.e. if stress, potential harm, or related questions or concern arise despite the precautions taken). Researchers also have an obligation to remove any consequences that might arise from the experiment.

Issues also arise when the research involves collecting personal information. The participant must be protected from stress by all appropriate measures (e.g. assurance that answers to personal questions need not be given). If the experiment involves collecting personal data there should be no concealment or deception.

Finally, psychologists have a responsibility when disseminating the results of their work to others (including parents and teachers). The main problem is that evaluative statements may carry unintended weight.

Giving advice

During research, you may (especially if you do clinical work) obtain evidence of psychological or physical problems of which a participant is, apparently, unaware. In such cases, the psychologist should inform the participant if, and only if, they believe that by not doing so the participant's future well-being may be endangered. So, for example, if you had reason to believe that your participant was suicidal, it would be a good idea to encourage them to seek professional help.

If as a result of your research, or because you detected a problem, a participant solicits advice concerning educational, personality, behavioural or health issues, caution must be exercised. If the issue is serious and you are not qualified to offer assistance, the appropriate source of professional advice should be recommended. Sticking with our suicidal participant, if you're not a qualified clinical psychologist then you shouldn't try to help this person, but of course you can take practical steps to assist them in getting the help they need (for example, giving them the phone number of the university counselling services, or phoning on their behalf with their permission).

Appreciating the limitations of your expertise is one of the key guidelines of the code of conduct that extends beyond research settings. As psychologists, you should not comment on things about which you're unqualified to give an opinion. So, although an expert on child anxiety could reasonably appear on a TV show to discuss anxiety in childhood, the same person should not appear on television offering opinions about the neurological consequences of boxing matches (unless of course he also happens to be an expert on this in his spare time!).

Experimental designs

We saw in the previous chapter that experimental designs seek to answer research questions by manipulating one variable to see its effect on another variable. For example, if we wanted to see whether 'practice makes perfect' in the context of, say, playing the drums, we could manipulate the variable 'practice' by getting different groups of people to practise different amounts each day, then we could see the effect that this had on their performance. This section looks at experimental designs: that is designs where the researcher actively manipulates one or more variables to uncover the effect it has on other variables.

The function of control groups

It's one thing to manipulate a variable and look at the effect that this manipulation has, but it's another step to then draw inferences about cause and effect. Mill proposed (see page 547) that causal factors could be isolated only by comparing two conditions: one in which supposed cause is present and one in which supposed cause is absent. In our drumming example, it wouldn't be sufficient to just vary the amount of practice that people had, there would need to be a condition in which the proposed cause (practice) was absent. In other words we'd have to have some people who didn't practise at all. In saying this, Mill had suggested a control condition. A control condition is simply a condition that is identical in every respect to your other conditions, except that the proposed cause is not present. A control condition acts as a baseline against which to compare behaviour when a proposed cause is present.

For example, imagine you wanted to test the notion that women become anorexic because the media constantly bombards them with images of skinny ill-looking waifs. Our proposed cause is the images of skinny ill-looking

CLASS ACTIVITY BOX 37.1

Ethics

Below is a description of an actual piece of research. In small groups, discuss what you think are the main ethical issues in this piece of research. Try to think about issues under all of the headings discussed in this chapter: informed consent, deception, debriefing, freedom to withdraw, confidentiality and protection of participants.

Campbell, Sanderson and Laverty (1964) were interested in the effects of traumatic experiences on learning. You should be familiar with the learning account of anxiety (see Chapter 33) in which anxiety about a stimulus develops as a result of that stimulus being associated with some negative outcome (like little Albert becoming afraid of his rat because he associated it with Watson and Rayner making a loud noise with an iron bar). Campbell *et al*. wanted to extend these ideas to see whether anxiety would subsequently subside when the stimulus was presented without the associated trauma.

Stimuli: the conditioned stimulus was a tone (which was affectively neutral) and the traumatic outcome was respiratory paralysis induced by Scoline (succinylcholine chloride). This drug has the effect of paralysing the participant without acting as an anaesthetic, so participants are fully conscious except they can no longer breathe.

Participants: 11 alcoholic patients volunteered, having been told that the experiment 'was connected with a possible therapy for alcoholism' (p. 629) – five experimental participants, six controls (three of whom heard only the tones and three of whom only received the respiratory paralysis). These six participants were either 'discharged from hospital or ran away' (p. 629) before the experiment was over.

Method: in essence, participants first habituated to the tone, and then the Scoline was administered. As the drug took effect 'the most noticeable feature of the onset of the paralysis was a fibrillation of the facial muscles followed by closing of the eyes. The impression which one got . . . was that he had been taken by surprise' (p. 629). Paralysis lasted between 90 and 130 seconds, after which participants 'recovered partial use of their limbs first and made ineffective jerky movements which appeared to be an attempt to remove something which was covering their faces' (p. 629). At a later date the tone was presented without paralysis to see the time over which the conditioned anxiety response would continue.

How traumatic was the paralysis? Campbell *et al*. report the following.

- 'Once the paralysis had passed off the subject lay very quietly on the table. Several of them asked for a reassurance that they would not be given a second trial' (p. 631).
- 'After the conditioning each subject was asked to describe what had happened to him and to say what he had felt. The impression which one obtained from listening to these accounts was that, although each subject found it difficult to put his sensations into words, and that many of the feelings arising from the skeletal paralysis were so unfamiliar that they could not be referred to any ordinary conception of bodily function, the suspension of breathing was an experience that was horrific to a degree' (p. 631).
- 'All the subjects . . . said that they thought they were dying. One subject made this comparison: he had been a rear-gunner in a Stirling bomber which had flown, during one operation, straight and level for 5000 yards on a radar beam over Düsseldorf; he rated the Scoline trial as the more traumatic experience of the two' (pp. 631–2).
- 'The subjects described their movements as part of a struggle to get away from the apparatus and to tear off the wires and electrodes. Though in fact their movements were small and poorly controlled the subjects were under the impression that they had been making large movements' (p. 632).

Results: participants produced physical reactions associated with anxiety when they heard the tone. Even when the tone was no longer followed by the paralysis, the anxiety did not subside (even a week later and after 100 presentations of the tone alone).

Answers

This experiment is amazing if only because it's hard to believe that people used to get away with doing this kind of thing (for the record, the design of the study leaves a lot to be desired, but more on that later). It really has got everything: deception, traumatic consequences, and no debriefing. To begin with they used a vulnerable group (alcoholics) and there is no evidence in the published article that they informed them at all about what would happen to them. They were encouraged into the experiment by being told that the research was connected with a possible therapy for alcoholism. Although this may well have been true, it is taking advantage of the alcoholics' desire to be cured (remember they were all hospitalised). You could argue that they were deceived in that they omitted to give participants a fairly important piece of information about the procedure that might have affected their decision to participate (the respiratory paralysis). Participants were not returned to their original state (or debriefed). There is nothing in the paper to suggest that any kind of counselling was given to the participants either. They also underwent a procedure that compromised their right to withdraw (once the paralysis had set in there was nothing that could stop it!).

waifs, and our effect is dieting or anorexia. To verify that the images are the cause of dieting we would need to have one condition in which images of skinny waifs were presented to people and one where those images are not presented.

As we've seen before, in experiments we manipulate one variable to observe its effect on another. The variable that we typically manipulate is the one we have proposed as a cause and in the simplest situation we manipulate it by changing whether the cause is present or absent. These manipulations are known as levels of the variable. The most basic experiment manipulates the causal variable so that it has two levels (supposed cause present vs supposed cause absent). However, we can have more than two levels. For example, we could manipulate not just whether people are exposed to pictures of skeletal celebrities and models, but also the degree to which they're exposed to these images. We could look at when a person isn't exposed to any images (the control), when they're exposed to 20 images a week, 40 images per week and 100 images per week. The 'images' variable now has four levels (0, 20 per week, 40 per week, 100 per week).

It was mentioned in passing that the control condition needs to be identical to all other conditions *except* that the cause is absent. In fact, all experimental conditions should be identical in every respect except for the manipulation that you've made. Put another way, all random factors should be held constant. To do this we have to ensure that all aspects of our experimental conditions are the same and you can take this idea to varying degrees of extreme. In the imagery experiment, for example, it might be sensible to make sure that everyone was roughly the same weight to begin with because, presumably, the weight you are has some influence over your desire to diet. In general, you would hope to test everyone in the same room and use identical instructions to ensure that these factors aren't contributing to whatever effects you get.

Self-test: Why is a control group important in an experiment?

Random sampling and why it's important

In the previous section, I mentioned in passing that in the imagery experiment we might want to make sure that all participants were roughly the same weight. This comment alluded to an important point about how we allocate participants to experimental conditions. We can rule out many random influences on our experiment simply by randomising parts of the study. The first important thing to do is to make sure participants are randomly allocated to your experimental and control groups. Imagine we went to a slimming club and showed the people there images of waif-like celebrities, then measured the amount of weight they lost over the next few weeks. We then went to a 'fat and proud' group meeting to collect our control data (where no images are shown). We might find that those shown images were more likely to lose weight than those not shown images. However, this result is of course because those who were shown images were already at the slimming club (therefore wanting to lose weight) whereas those not shown images had a positive attitude towards their bodies and didn't feel the need to diet. The effect of imagery has been confounded with the fact that we used two very different groups of people in which to collect data (the variable of whether people were at the slimming club or 'fat and proud' is said to be a confounding variable, which we encountered in the previous chapter).

There's nothing inherently wrong with using these two groups of people, but we must randomly (and preferably evenly) allocate them to both groups (that way we know that any people from weight watchers are present in both groups and so the effect of weight watchers will cancel out). If you think of how complex the average human is (how much humans differ in intelligence, motivation, emotional expression, physical characteristics) you should realise how important it is to randomly allocate people to experimental groups: it ensures a roughly equivalent spread of attributes across all groups.

Self-test: Why is randomisation of participants to experimental groups important?

The same people or different?

Let's take a step back for a minute and think what would happen if we did not introduce an experimental manipulation (i.e. we didn't bother showing anyone any images of skinny women). If there is no experimental manipulation then we expect the people in the experimental group to behave in roughly the same way as the control group. However, performance won't be identical, there will be small differences in performance created by unknown factors. For example, there will be subtle differences in people's natural desire to diet, they will differ in their upbringing (whether their parents thought it was great to be skinny people), their IQ and all sorts of other variables. These other factors are known as extraneous variables and variation in performance created by these variables is known as unsystematic variation.

Now imagine we introduce an experimental manipulation (i.e. in this case present some of the people with images of skinny women), then we do something different to the participants in condition 1, to what we do to those in condition 2. This should have an effect on the performance in the two groups. Differences in performance created by a specific experimental manipulation are known as systematic variation.

The key to any research is to work out which variation is caused by the manipulation and which is caused by extraneous variables. So, far I've used the example of when we have different people in our experimental conditions. This type of design is known as an independent measures design (also called a between-group design). In these designs there will be lots of extraneous variables at work and that's why it's absolutely vital to allocate different people to different conditions randomly. Randomisation ensures that none of these extraneous variables can have too much of an impact on the outcome.

A second alternative is to control some of the obvious extraneous variables. In our imagery study we could weigh everyone, then for everyone we allocate to the experimental group, we find someone of roughly the same weight and allocate them to the control group. You can do this with other variables too and it's not uncommon to see designs in which the researcher has for every person in one group found someone with the same IQ, gender and age for the control group (IQ, gender and age being the extraneous variables that most psychologists commonly worry about). This is known as a matched design because every participant in one experimental group is matched on certain critical variables with a participant in another group.

We can take things even further by just using the same people but at different points in time (so, test the same people two or more times). This has the obvious advantage that virtually all individual differences between participants is controlled because they're the same people and so only things like mood and motivation could change over time. This is known as a repeated measures design (also called a within-subjects design). In a repeated measures design, differences between experimental conditions can be caused by only two things: (1) the manipulation that was carried out on the participants, or (2) any other factor that might affect the way in which a person performs from one time to the next. The latter factor is likely to be fairly minor compared with the influence of the experimental manipulation. In an independent design, differences between the two conditions can also be caused by one of two things: (1) the manipulation that was carried out on the participants, or (2) differences between the characteristics of the people allocated to each of the groups. The latter factor in this instance is likely to create considerable random variation both within each condition, and between them. Therefore, the effect of our experimental manipulation is likely to be more apparent in a repeated measures design than in a between-group design.

However, repeated measures designs do have their price. When the same people participate in more than one experimental condition, although they are naive during the first experimental condition they come to the second experimental condition with prior experience of what is expected of them. At the very least they will be familiar with the task they're performing or what you're measuring. Therefore, you will get practice effects, where participants perform differently in later conditions simply because of familiarity with the experimental situation. A second problem is boredom effects, where participants perform differently in later conditions because they are tired or bored from having completed the earlier conditions.

Although these effects are impossible to eliminate completely, we can again use randomisation to minimise the effect they have. Imagine we wanted to test the effect of frustration on aggression. We got people to sit in a room and every so often the experimenter would flick their ears. We counted how many times the participant punched the experimenter. Obviously, in the control condition the experimenter doesn't flick the person's ears. If everyone did the experimental condition first, then it's likely that by the time they took part in the control condition they would already be pretty hacked off (from having their ears flicked for an hour) and so still might be quite aggressive to the experimenter. Therefore, we have to make sure that some people do the experimental condition first and the control condition second, whereas others do the control condition first and the experimental condition second. This is known as counterbalancing.

Self-test: What is the difference between a 'between-group' design and a 'repeated measures' design? What are the advantages and disadvantages of each?

Designing the study: some common experimental designs

The exact experimental design that you use will depend on what question you're trying to answer. However, we can look at a few common designs which may give you inspiration! The post-test only control group design is the most straightforward type of true experiment that you can perform (see Figure 37.2). It has two experimental conditions and uses different people in each condition. So, you randomly divide participants into two groups, and do something to one group (the experimental group or treatment group) that you don't do to the other group (the control group or no treatment group). The performance of the two groups is then measured: if it differs, then you can be reasonably confident that the difference is attributable to your experimental manipulation. There are times when you might have more than one experimental manipulation, in which case you can simply add a third group that engages in a different experimental procedure (Figure 37.3). In fact, you can add as many different experimental groups as are required.

Although the post-test only design is common in psychology, it has a problem: although participants are randomly assigned to the two conditions to make sure that the groups are equivalent, there is no check within the design that the groups actually are equivalent. One improvement is, therefore, to measure behaviour before the manipulation in addition to after. If randomisation has been successful then the groups should behave the same on the measure before the experimental manipulation, but their behaviour will differ *after* the experimental manipulation. (To be specific, behaviour in the experimental group should change because they have had the experimental manipulation whereas behaviour in the control condition shouldn't change because they haven't had the experimental manipulation.) This design is called a pre-test/post-test control group design (Figure 37.4). As with the post-test only design, this design can be extended to

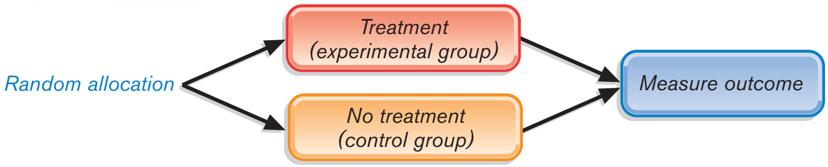

Random allocation
Treatment (experimental group)
No treatment (control group)
Measure outcome

Figure 37.2 The post-test only control group design

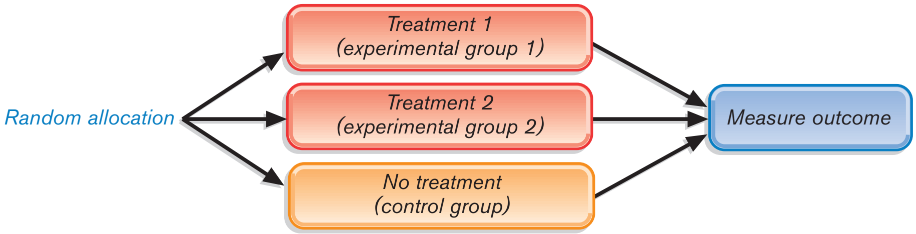

Random allocation
Treatment 1 (experimental group 1)
Treatment 2 (experimental group 2)
No treatment (control group)
Measure outcome

Figure 37.3 The post-test only control design with several experimental conditions

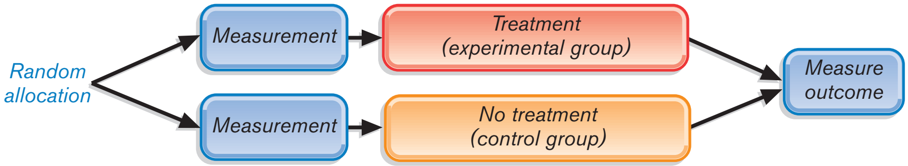

Random allocation
Measurement
Measurement
Treatment (experimental group)
No treatment (control group)
Measure outcome

Figure 37.4 The pre-test/post-test control group design

include more than one experimental condition. One thing to note is that in the pre-test/post-test design we have one variable that uses different participants (the experimental groups) and one that uses the same participants (measures are taken at two points in time). When there is a mixture of independent measures and repeated measures the design is called a mixed design (or mixed-plot design).

One problem with pre-testing participants is that this pre-testing might influence their subsequent behaviour. Therefore, if you're feeling really paranoid you can control for this possibility by adding an extra two groups who do not have their behaviour measured before the experiment. This way, not only do we have the advantages of the pre-test/post-test design but we also can check whether the pre-testing has any effect. This is known as the Soloman four-group design (Figure 37.5). Although this is an extremely rigorous design it is very expensive in terms of time and participants and so is rarely used.

So far we've looked at designs that use different groups of participants. There are also some basic designs that use only repeated measures. The post-test only two condition group for repeated measures uses the same participants. They take part in the experimental condition and then have their behaviour measured, then take part in the control condition and then have their behaviour measured. To control for practice effects, a different group of participants, go through exactly the same process but in the opposite order: they do the control procedure first and then the experimental procedure. Participants must be randomly allocated to these two counterbalancing conditions (Figure 37.6). A variation on this theme is to measure behaviour in both conditions before participants engage in any of the conditions (Figure 37.7).

CLASS ACTIVITY BOX 37.2

Experimental design

In groups, think back to the experiment described in Class Activity Box 37.1. Can you spot the big flaw in the design of this study?

answers at the end of the section

Obviously there are more complex designs than these (see Field and Hole, 2003 for some examples), but these 'simpler' designs should give you a flavour of the types of things that can be done.

Non-experimental designs

Quasi-experimental designs

A quasi-experimental study is one in which the experimenter does not have complete control over the manipulation of the predictor variable. The experimenter has control over measuring the outcome, but for whatever reason they cannot randomly allocate participants to experimental conditions. A good example is clinical psychological research, where ethical considerations prevent you from manipulating certain variables. For instance, if you wanted to look at the effect of having depression on the way you think, it would be unethical to randomly allocate people to 'depression', in which clinical depression is induced, and 'control' conditions. Instead we wait for people to naturally develop depression and then compare them to those that haven't developed depression. The important thing is that these groups are not randomly allocated: the depressed people are self-selecting. There are other predictor variables that simply cannot be manipulated even if ethics permitted it, for example we're often interested in the effects of things like gender. In this case we again cannot randomly allocate people to conditions of 'male' and 'female', we instead have to use males and females.

The consequence of not randomly allocating people to experimental conditions is that it is not possible to isolate cause and effect as conclusively as with a 'true' experimental design.

Self-test: What is the difference between an experimental design and a quasi-experimental design?

Cross-sectional designs

Cross-sectional designs are when many variables are measured simultaneously but none of them is manipulated (read back to the previous chapter, where we encountered this kind of design before). This is sometimes called 'correlational' research, because all we can do with this kind of research is to look for relationships between the variables we've measured. We can't look for cause–effect relationships because we haven't manipulated any of the variables, and also because all of the variables have been

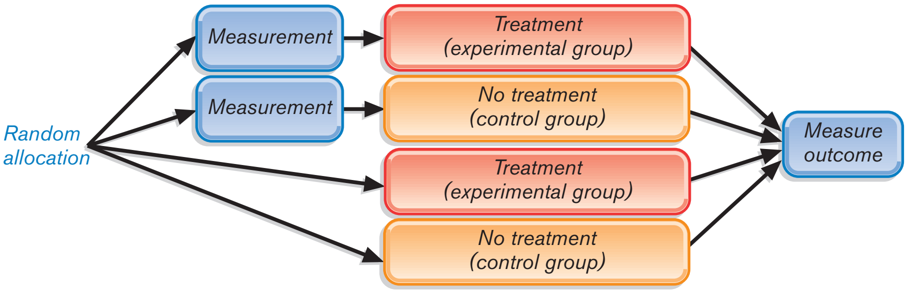

Random allocation
Measurement
Measurement
Treatment (experimental group)
No treatment (control group)
Treatment (experimental group)
No treatment (control group)
Measure outcome

Figure 37.5 The Soloman four-group design

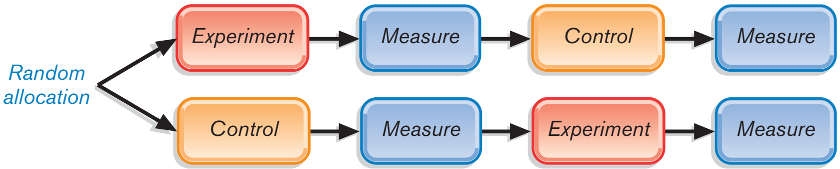

Random allocation
Experiment
Measure
Control
Measure
Control
Measure
Experiment
Measure

Figure 37.6 The post-test only two-condition repeated measures design

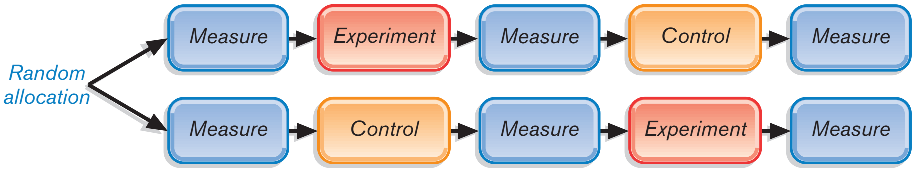

Random allocation
Measure
Experiment
Measure
Control
Measure
Measure
Control
Measure
Experiment
Measure

Figure 37.7 The pre-test/post-test two-condition repeated measures design

APPLICATIONS BOX 37.1

How some standard experimental designs have been used in real research

Below are described some famous experiments (that have hopefully been mentioned elsewhere in this book!) that use the standard experimental designs that have been described in this chapter.

Festinger and Carlsmith (1959): Cognitive dissonance

Festinger (1957) put forward the idea of cognitive dissonance: inconsistencies in our cognitions generate unpleasant feelings (dissonance) and, therefore, people are motivated to change their cognitions to be consistent with their behaviour. Festinger and Carlsmith (1959) put this theory to the test by getting students to engage in an extremely tedious task (turning pegs in a tray for 30 minutes), and then asking them to tell the next participant that the experiment was really interesting, exciting and fun. Participants were either paid $1 or $20 as an incentive to express these views to the next participant (and a control group did not interact with the next participant). Afterwards, a questionnaire was used to measure their attitudes about the research. Given that all participants would have found the experiment boring, the idea was that those paid $20 would express this opinion (and believe it) because they could reason that 'they lied about the experiment being fun because they received a large reward for that lie'. Those paid $1, however, would change their view of the experiment and believe that it really was fun because they had no incentive to lie. The design is a post-test only control group with several groups (Figure 37.8).

Rosenthal and Jacobson (1966): Blame the teachers

This study looked to see whether teachers' expectancies about their students influenced how those pupils developed academically. They went into a school and labelled some of the children as 'bloomers' (i.e. children whose intellect, based on their psychological assessment, should develop rapidly). Of course, the children were labelled completely randomly – 20% of pupils were randomly labelled as 'bloomers' (these were the experimental participants) and the remaining 80% were control participants. IQ was measured at the beginning of the experiment, the 'bloomers' were assigned by the experimenters and then they returned eight months later to measure IQ again. The theory was that the change in IQ scores would be bigger in the bloomers compared to 'non-bloomers' because teachers expected these children to 'bloom' (but remember that

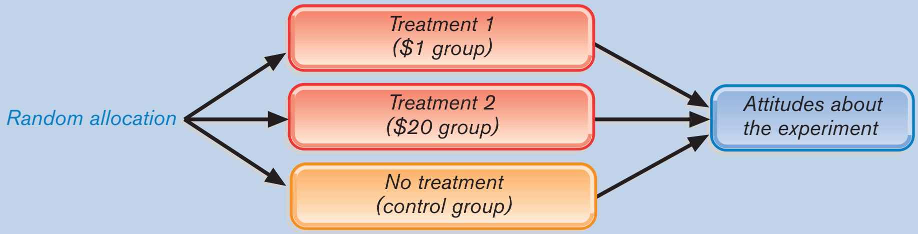

Random allocation
Treatment 1
($1 group)
Treatment 2
($20 group)
No treatment
(control group)
Attitudes about
the experiment

Figure 37.8

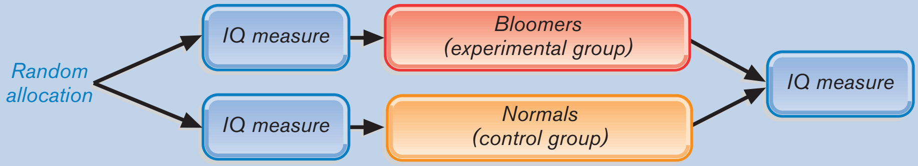

Random
allocation
IQ measure
IQ measure
Bloomers
(experimental group)
Normals
(control group)
IQ measure

Figure 37.9

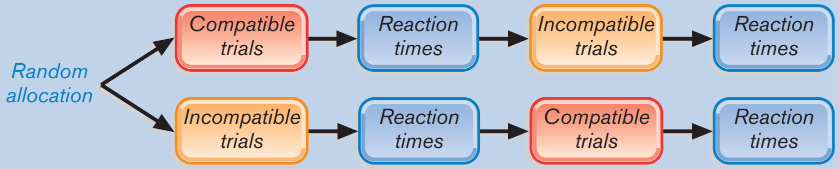

Random
allocation
Compatible
trials
Reaction
times
Incompatible
trials
Reaction
times
Incompatible
trials
Reaction
times
Compatible
trials
Reaction
times

Figure 37.10

APPLICATIONS BOX 37.1 CONTINUED

the bloomers were not any different to the other children in reality!). As such, this is an example of the pre-test/post test control group design in Figure 37.9.

Greenwald et al. (1998): Implicit attitudes

Greenwald et al. created the Implicit Association Task (IAT) to measure implicit attitudes. The IAT is based on the simple idea that it should be easier to map two concepts onto a single response when those concepts are related in memory than when the concepts are unrelated. For example, Greenwald et al. (Experiment 1) presented names of flowers (e.g. ROSE), insects (e.g. WASP), positive words (e.g. LOVE) and negative words (e.g. ROTTEN) on a computer screen. Participants categorised these words by pressing one of two keys on a computer keyboard and their latency to respond in ms was recorded. If ‘flowers’ and ‘positive’ are associated categories, and ‘insects’ and ‘negative’ are associated categories, then when responses to the concept ‘flower’ are assigned to the same response key as responses to the concept ‘positive’ and the concepts of ‘insects’ and ‘negative’ are both assigned to the other key, response times should be fast. These trials would be **compatible**. However, when the concepts of ‘flowers’ and ‘negative’ are assigned to the same key and ‘insects’ and ‘positive’ are assigned to the other then response times should be relatively slow because these categories assigned to the same key are **incompatible**. In a typical IAT, participants do compatible trials (as described above) and incompatible trials at different points in time, and the order in which these two types of trials is done is counterbalanced across two groups. Therefore, we have the post-test only repeated measures design in Figure 37.10.

measured at the same point in time (I mentioned this point on page 547). In psychology, probably the most common cross-sectional research that you’ll come across is when someone has administered several questionnaires that measure different aspects of behaviour to see which aspects of behaviour are related.

Observing people

One way to find out about human behaviour is simply to watch it! Many sciences that like to think of themselves as ‘hard sciences’ rely heavily on observational methods. In fact possibly the most classic example of how observation can inform scientific theory is the case of a certain Isaac Newton, who observed (well, experienced might be a better word than observed) an apple falling out of a tree and onto his head. Shortly afterwards we had the theory of gravity, which is still used today. Physicists, chemists, ecologists and the like often observe the behaviour of things (particles, atoms, sub-atomic particles, birds, worms etc.) before trying to explain that behaviour. Psychology can likewise benefit immensely from observing the behaviour of people.

Psychologists will often videotape people, or watch them from an unobtrusive location (in fact, it has been known for them to hide up a tree!). They will then attempt to analyse or ‘code’ the behaviour they observe. Coding behaviour simply means that you try to find regularities in what people do (so, when watching children in a playground you might distinguish between an aggressive act and a non-aggressive act). The strength of observational methods is that they enable one to get a good idea of how people normally behave (it has *ecological validity*). This may be quite different from how they behave in an experiment.

The downside to observational methods is that because of their non-intrusive nature, they don’t allow the identification of cause and effect in the same way that a well-designed experiment does. However, systematic observations may often provide hypotheses about cause and effect that can then be tested more directly with experimental methods.

Observational methods also have specific ethical considerations. If you do an observational study you must respect the privacy and psychological well-being of the individuals studied. Unless consent to being observed is first obtained, observational research is acceptable only in situations where those observed would expect to be observed by strangers. Local cultural values need to be considered and you should ensure that you’re not intruding upon the privacy of individuals who, even while in a normally public space, may believe they are unobserved.

For more information on observational techniques see Martin and Bateson (1993).

Single subject designs and case studies

A case study is an in-depth analysis of a single person. Often this person will be unusual in some respect (for example, it might be useful to do a detailed study of someone with multiple personality disorder or someone who has brain damage). Case studies can be an extremely good way to generate theories and are based on what’s known as the idiographic approach to research, which just means developing knowledge on a case-by-case basis. The opposite is the nomothetic approach, which is the approach of experimental methods: knowledge is developed by studying small numbers of variables in large numbers of people.

The advantage of case studies is that they give us much richer data and allow individual differences between people to shine through. Although it’s convenient to think that all

APPLICATIONS BOX 37.2

How some standard non-experimental designs have been used in real research

Below are described some famous experiments (that have hopefully been mentioned elsewhere in this book!) that use the non-experimental designs that have been described in this chapter.

Gray et al. (2003): Psychopaths like violent words

Gray et al. (2003) used the IAT (described in Applications Box 1) to look at whether different groups of people found violent words pleasant or unpleasant. Participants had to classify positive words (e.g. LOVE) and negative words (e.g. ROTTEN), and violent (e.g. Kill) and peaceful words on a computer screen. Participants categorised these words by pressing one of two keys on a computer keyboard and their latency to respond in ms was recorded. Compatible trials were deemed to be trials in which responses to pleasant and peaceful words were made by pressing the same key, and responses to negative and violent words were made by pressing the same key. Incompatible trials were ones in which responses to pleasant and violent words were made by pressing the same key, and responses to unpleasant and peaceful words were made using the same key. If people found violent words unpleasant then response times should be shorter for compatible trials than incompatible ones. They tested four self-selecting groups: psychopathic murderers, psychopathic other offenders, non-psychopathic murderers, non-psychopathic other offenders. They found that psychopathic murderers showed a reduced IAT effect; that is, they found violent words more pleasant than other people! This design is *quasi-experimental* because the different groups of people are not randomly sampled (because they belong to specific naturally occurring groups). It would have been unethical to do a true experiment and to try to induce people to become psychopathic murderers (although if we had done this it turns out that writing research methods book chapters is a good way to induce this . . .).

Watson and Rayner (1920): Albert the Great

Watson and Rayner's study showing that little Albert could be taught to fear his pet rat just through experiencing traumatic consequences (see Chapter 33) is one of the most famous psychological examples of a **case study**.

Rosenhan (1973): You don't have to be mad to be treated here, but it helps

Rosenhan (1973) elegantly demonstrated that diagnostic labels change perceptions of the person. Over some time, he got 8 'normal' people to report to 12 psychiatric hospitals with symptoms of hearing voices saying 'empty', 'hollow' and 'thud' (see Field, 2003). All were consequently diagnosed as schizophrenic despite not having the disorder. However, Rosenhan reported that subsequent to their diagnosis, doctors and staff treated these pseudopatients differently; for example, staff would ignore the pseudopatients' attempts at conversation, their normal histories were distorted into tales of ambivalent relationships and outbursts were attributed to the pathology and not the behaviour of staff, and so on. This showed how 'labels' affect the way in which people are treated. This was an **observational** study as the pseudopatients observed and noted how people treated them after their diagnosis.

schizophrenics experience the same things, in reality, they have extremely varied experiences. The downside of case studies is obviously that it isn't possible to generalise the results from them beyond the person you've tested. There are many ways to conduct research on single individuals and case studies can be experimental. For some information about doing experimental research on single cases see Field and Hole (2003).

The relationship between design and analysis

Having looked at different ways that data can be collected, I want to briefly turn to two really important issues about data analysis.

Design affects analysis and analysis affects design!

Design and data analysis tend to get treated as two different and independent processes. However, they are very much related, and although I won't be talking in any depth about data analysis until the next two chapters, I do want to drum it home that you should be thinking about how you will analyse your data when you design your research and not after you've collected the data! Speaking from experience, there is nothing more frustrating than colleagues presenting you with data they've collected and asking you how to analyse them. Usually the answer is that they can't analyse them (statistics does have some limitations), which means that they've wasted their time, or that they have to engage in highly inappropriate data analysis.

So, having designed your study ask yourself: how will I analyse the data? If, having read the next two chapters, you find an appropriate statistical procedure to analyse the data you are going to collect then fine, pat yourself on the back and go and collect the data. If, however, there doesn't seem to be an obvious way to analyse the data you're going to get, then STOP! Try to find out why you can't find an appropriate statistical procedure and how you can adjust your research design so that the resulting data can be analysed with an existing statistical technique.

Causal inferences

A second point about statistics is that there is sometimes a misconception that certain statistical techniques allow you to make causal inferences. For example, although you won't know what an ANOVA is for another two chapters, some people think that ANOVAs allow causal inferences whereas correlations do not. This isn't true, it's just that ANOVA is often used to analyse experiments in which causal variables have been manipulated. However, it's not the ANOVA that allows causal inferences it is the way the experiment was conducted. Similarly, multiple regression is a technique for predicting values of one variables from values of other variables (see page 593). Some people think that this is causal: if hours spent writing a book chapter predict the desire to swallow sulphuric acid then the writing must cause the desire for painful death. However, statistically there is nothing to say that the desire for a painful death couldn't cause the writing! The point is that statistical procedures do not allow causal inferences: the way you conduct your research does.

Self-test: From which types of research designs can you not infer causal relationships?

How do you find people to test?

Having considered all of the numerous aspects of designing research that we've covered in this chapter, the final stage of the process is to think about how you're actually going to find people to test!

Populations and samples

Psychologists are typically interested in looking for general rules about all people (i.e. how do people learn things?). The best way to find these general rules is obviously to gather data from every single person on the planet. The complete collection of things (be they humans, cats, or mice) is known as a population. Populations can be very general (i.e. all people), more specific (i.e. all men) or extremely specific (i.e. all men who sing 'You've lost that loving feeling' by the Righteous Brothers when they've had too much Stella Artois to drink).

If a psychologist wanted to access the entire population this could mean gathering data from everybody on the planet, which, as you might well imagine, would be impossible. Therefore, we collect data from a small subset of the population we're interested in, known as a sample from the population. We use this sample to estimate what we would have found had we actually gathered data from the entire population. Intuitively you might think that larger samples are better than small ones – if your population contains 10 billion people and you collect data from 1 billion, then you should get a more accurate picture of the population than if you collected data from five people. Think of it like this: imagine you're in the pub one night (that serves Stella Artois) and at the end of the evening a bearded man stands up and sings 'You've lost that loving feeling'. Would you be prepared to assume that everyone sings this song when drunk? Probably not, you'd just think there was a drunken weirdo in the pub. What about if you went to ten different pubs and in each one a bearded man sang that song? You might start to think that perhaps there was something going on: Stella Artois does cause bearded men to sing the Righteous Brothers. How about if we go to a very big pub (serving Stella Artois) full of men with facial hair and observe 1000 of them singing the Righteous Brothers? You'd probably think you were in Belgium, but after that your confidence that Stella genuinely has this strange effect on bearded men should be really high because you've seen the same behaviour in a large number of bearded men. Jacob Bernoulli termed this the 'law of large numbers' (the fact that large samples are more representative than small ones – not that bearded men sing the Righteous Brothers!). The behaviours we observe in different samples will differ slightly, but because large samples are more representative of the population than small ones the behaviour observed in different large samples will be relatively similar whereas the behaviour observed in different small samples is likely to be quite variable. As such, sampling is the process of finding people who are representative of the population you want to make inferences about.

Methods of sampling

Random sampling is where every person in the population of interest has an equal chance of being selected to take part in the research. This rarely happens, if ever. The only way to achieve this is to take the name of every person in the population and stick their name in a hat (or other receptacle), and then pick out names (or do some computerised analogy of this). This is extremely complex, because even if you have some snazzy computer to do it for you then you could literally spend your life in endless debates with statisticians about how randomly the computer was selecting names! An easier method is systematic sampling, in which you still have your list of names from the entire population but you just pick every *n*th person from that list (where *n* is just a convenient number). So, we could just test every 13th person on the list of names.

Another way to try to make the sample as representative as possible is to use quota sampling in which you try to control the characteristics of your sample to match those of the population. So, for example, if it turns out that your population contains 60% women, has an average IQ of 103, average age of 24, and certain cultural or ethnic distribution, then you make sure that your sample also has 60% women, has an average IQ of 103, average age of 24 and the same cultural and ethnic characteristics.

In reality psychologists don't always do these: they tend to do research on whoever they can get hold of at the time! One way of doing this is to sample a specific group of people. For example, if your population is sewage workers, then you might test all sewage workers in Brighton (the assumption being that sewage workers in Brighton are not that different to sewage workers in Oxford, or anywhere else in the UK). This is called cluster sampling because you're using an established group of people who are representative of the population of interest.

You can also use opportunity sampling, which is a sample of people willing to take part in your research when asked. So, for example, you go around people within the population of interest, ask them if they'd mind you sticking a huge electrode in their brain, and those that say 'yes' are tested. This is subtly different from volunteer sampling which is when you test people who put themselves forward to take part in research (perhaps in response to an advertisement). Opportunity and volunteer sampling are fairly similar. However, Miles (2001) points out that it's worth considering that people who volunteer for experiments may be different to people who will take part if asked, but might not volunteer themselves otherwise. In any case, these sampling methods are by far the most common in psychology.

A final method is known as snowball sampling, which is when you use participants to obtain other participants. The idea is that you might test someone and then ask 'do you have any friends who might want to take part?'. The obvious down side of this is that you could end up with a very biased sample (at least if you believe that people are friends because they have certain things in common).

In reality, the sampling you use won't fit nicely into these boxes. Whatever your good intentions, after a few months of trying to collect data you'll soon be asking anyone and their dog to take part in your study.

Summary

This chapter has looked at how we conduct research. We began by considering ethics. We saw that it's important to inform people about what you're doing and to get their consent. It's also important not to deceive people and to debrief them properly. We then looked at experimental designs and saw how they allow us to make causal inferences provided we use control conditions and randomisation. We discovered that we can manipulate variables using the same people (repeated measures) or different people (independent measures) before overviewing some commonly used experimental designs (and real examples of them). We also saw that non-experimental techniques such as observation and case study can be useful as well. Finally, we looked at lots of different ways to find people to test.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Understand the BPS code of conduct for conducting ethical research.
2. Understand why experiments allow us to make causal inferences.
3. Understand basic experimental research designs.
4. Have a basic understanding of non-experimental methods such as quasi-experimental, cross-sectional observational and case study methodology.
5. Know the differences between sampling methods.

Further reading

Banyard, P. and Grayson, A. (2000) *Introducing Psychological Research: Seventy Studies that Shape Psychology*, 2nd edn. Basingstoke: Palgrave. A really great book that describes 70 well-known psychology experiments. For each one it describes the design results and theory behind them. This is a really interesting way to explore research methods in the real world.

British Psychological Society (2006) Code of conduct, ethical principles, and guidelines. Leicester: BPS [available online from http://www.bps.org.uk/the-society/ethics-rules-charter-code-of-conduct/code-of-conduct/code-of-conduct_home.cfm].

Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage. Gives a lot more detail on experimental design and data collection.

Martin, P. and Bateson, P. (1993) *Measuring Behaviour: An Introductory Guide*, 2nd edn. Cambridge: Cambridge University Press. Essential reading for observational studies.

Miles, J. M. V. and Banyard, P. (2007) *Understanding and Using Statistics in Psychology: A Practical Introduction*. London: Sage. A very well-written overview of all aspects of experimental design and basic statistical analysis.

Essay titles and references

1 What are the ethical issues about which psychologists need to be aware?

Bersoff, D. N. (ed.) (2003) *Ethical Conflicts in Psychology*, 3rd edn. American Psychological Association.

British Psychological Society (2006) Code of conduct, ethical principles, and guidelines. Leicester: BPS [available online from http://www.bps.org.uk/the-society/ethics-rules-charter-code-of-conduct/code-of-conduct/code-of-conduct_home.cfm].

O'Donohue, W. T. and Ferguson, K. E. (eds) (2003) *Handbook of Professional Ethics for Psychologists: Issues, Questions, and Controversies*. London: Sage.

2 Design and describe an experiment to test whether people in sad moods remember negative news stories more than positive news stories. What methodological issues did you consider in your design and why did you reach the decisions that you did?

Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.

McFarland, C. and Buehler, R. (1998) The impact of negative affect on autobiographical memory: The role of self-focused attention to moods. *Journal of Personality and Social Psychology*, 75(6), 1424–1440.

Parrott, W. G. and Sabini, J. (1990) Mood and memory under natural conditions: Evidence for mood incongruent recall. *Journal of Personality and Social Psychology*, 59, 321–336.

Teasdale, J. D. and Russell, M. L. (1983) Differential effects of induced mood on the recall of positive, negative and neutral words. *British Journal of Clinical Psychology*, 22, 163–171.

3 Compare one type of non-experimental design (e.g. quasi-experimental designs, cross-sectional designs, observational designs or case studies) against an experimental design. What are the pros and cons of each type of design?

Davies, J., Howells, K. and Jones, L. (2007) Evaluating innovative treatments in forensic mental health: A role for single case methodology? *Journal of Forensic Psychiatry and Psychology*, 18, 353–367.

Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.

Gregory, D. (1986) In defense of cross-sectional methodology. *Bulletin of the British Psychological Society*, A130-A130 Nov.

Harris, F. C. and Lahey, B. B. (1982) Recording-system bias in direct observational methodology – a review and critical analysis of factors causing inaccurate coding behaviour. *Clinical Psychology Review*, 2, 539–556.

Research methods and statistics

38

Summarising data

Route map

Imagine you have just collected your first set of data. What on earth are you going to do with it? This chapter explains the basics of summarising and presenting your data. To begin with we look at histograms, which are a way of graphing raw data to see the distribution of scores. We'll discover some of the properties of histograms and find out about a special kind of distribution known as the normal distribution. It's important as scientists to summarise your data so that others can quickly and easily see what you have discovered. The chapter looks at some of the ways we can summarise data both in terms of what a typical score is (the mean, mode and median) and how diverse your scores are (the range, interquartile range and variance). Next, we look at some common ways of graphing these values, in particular bar charts, line charts, boxplots and scatterplots. Finally, we end with a few comments about how not to draw graphs!

Introduction

In Chapters 36 and 37 we discovered why and how psychologists collect data to tell them about how humans behave and the processes that might underlie this behaviour. Having collected data, psychologists often want to show other psychologists what they have found. One obvious way to do this is just to let other psychologists see all the data that you have collected. However, most of us have better things to spend our time doing than trawling through other people's data (although if you are your department's resident statistics 'expert', then other psychologists think you love nothing more than trawling through their data!). Therefore, we need ways to summarise our findings in succinct ways that can be easily understood by everyone. There are two ways to summarise data: (1) we can reduce our data down to a single value (or a few values if the data are complex); (2) we can display our data graphically. This chapter looks at some of the conventional ways that psychologists summarise and display their data.

Histograms, distributions and their properties

Frequency distributions

Once we have collected data from a sample of participants we need to summarise it so that we (and others) can see the general pattern of the data. One way of doing this is to reduce the data down to a few summary statistics, which is extremely useful for other people to get a quick and easy picture of what's going on. However, in doing this we lose a lot of information, and so when exploring the data yourself, the best first step is to create some kind of summary that includes all of the data you have collected. One way to do this is to plot a graph of all of the data and the best graph is one that shows how many times each score occurs. This is known as a frequency distribution, or histogram.

Properties of frequency distributions

Different frequency distributions can look very different; therefore, statisticians have come up with several properties that allow us to describe and compare distributions. These properties can be compared to values that we would find in a 'perfect' distribution. A perfect distribution would be distributed symmetrically around the centre of all scores: if we drew a vertical line through the centre of the distribution it should look the same on both sides. This ideal distribution is known as a normal distribution and is characterised by a bell-shaped curve, as in Figure 38.2. The bell-shape of the normal distribution implies that the majority of scores lie around the centre of the distribution (so the largest bars on the histogram are all around the central value). As we get further away from the centre the values become less frequent (the bars get smaller).

There are two main properties of distributions: skew, which refers to the symmetry of the distribution, and kurtosis, which refers to the pointy-ness of the distribution. In a skewed distribution the most frequent scores (the tall bars on the graph) cluster at one end of the scale. In positively skewed distributions, the frequent scores are clustered at the lower end and the tail of the distribution points towards the higher or more positive scores. In

CLASS ACTIVITY BOX 38.1

Draw a histogram

Imagine we did a 'Little Albert' style experiment (see Chapter 35) in which we took 50 children and placed them in a room with a white rat. Every time the rat came near them we played a short blast of a Cradle of Filth CD at loud volume (enough to scare anyone). After a few hours of this, we measured the amount of time the children would cry for when they saw the rat (without the death metal music).

Time spent crying: 27, 27, 28, 26, 21, 12, 9, 22, 22, 26, 24, 23, 14, 20, 26, 27, 14, 25, 22, 25, 20, 25, 25, 21, 22, 24, 25, 23, 22, 15, 27, 22, 22, 27, 22, 18, 25, 28, 25, 9, 17, 27, 27, 24, 19, 23, 6, 25, 26, 18

The first thing we can do is to arrange these scores into ascending order:

Time spent crying: 6, 9, 9, 12, 14, 14, 15, 17, 18, 18, 19, 20, 20, 21, 21, 22, 22, 22, 22, 22, 22, 22, 22, 23, 23, 23, 24, 24, 24, 25, 25, 25, 25, 25, 25, 25, 25, 26, 26, 26, 26, 27, 27, 27, 27, 27, 27, 27, 28, 28

It's now easy to count how many times each score occurs (this is called the *frequency*). So, for example, we can easily see that only 1 child cried for 6 seconds, but 8 children cried for 25 seconds. To plot a frequency distribution, we simply count the frequency for each score and then plot a graph with the time spent crying on the horizontal axis (also called the *X-axis* or *abscissa*), and the frequency on the vertical axis (also called the *Y-axis* or *ordinate*). The graph of the data above would look like this:

Even with this relatively small amount of data two things become clear that were not obvious from the unordered raw scores: (1) there were no children who didn't cry at all (in fact, all children cried for at least 6 seconds), (2) the majority of children cried for 22 seconds or more (the bars get higher at this point), and (3) the most frequent amount of time spent crying were 22 and 25 seconds, because these two values have the highest bars!

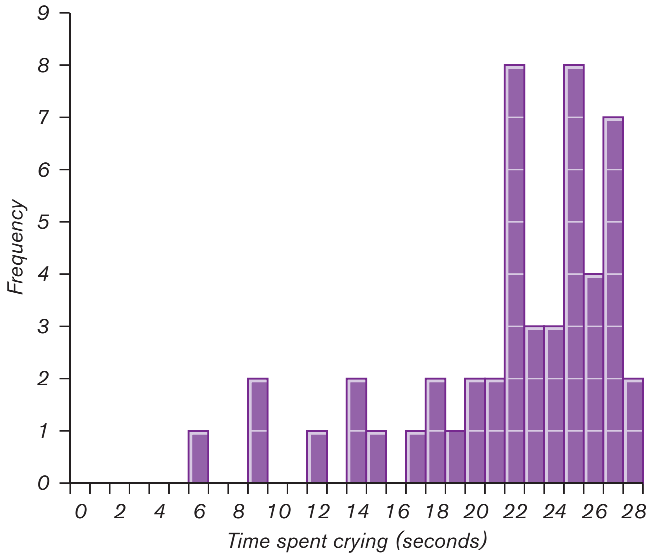


Figure 38.1 The sample data represented graphically

negatively skewed distributions the opposite is true: frequent scores cluster at the higher end and the distribution tails off towards the lower, more negative, scores (Figure 38.2).

Kurtosis is the degree to which a distribution is pointy and has too many or too few scores in the tails (Field, 2009). A positively kurtosed (leptokurtic) distribution (kurtosis $>$ 0) has too many scores in the tails and is too peaked, while a negatively kurtosed (platykurtic) distribution (kurtosis $<$ 0) has too few scores in the tails and is quite flat (Figure 38.3). We can measure skewness and kurtosis and these values are 0 in a normal distribution. Therefore, if your frequency distribution has positive or negative values of skewness or kurtosis, this tells you that your distribution deviates somewhat from a normal distribution.

Self-test: Write down what you understand by the terms positive skew, negative skew, leptokurtic and platykurtic.

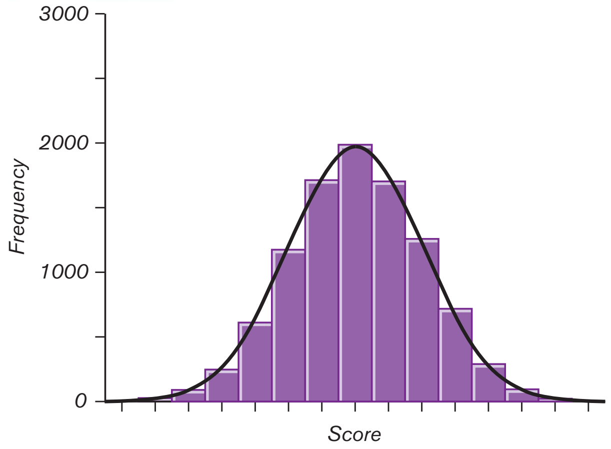
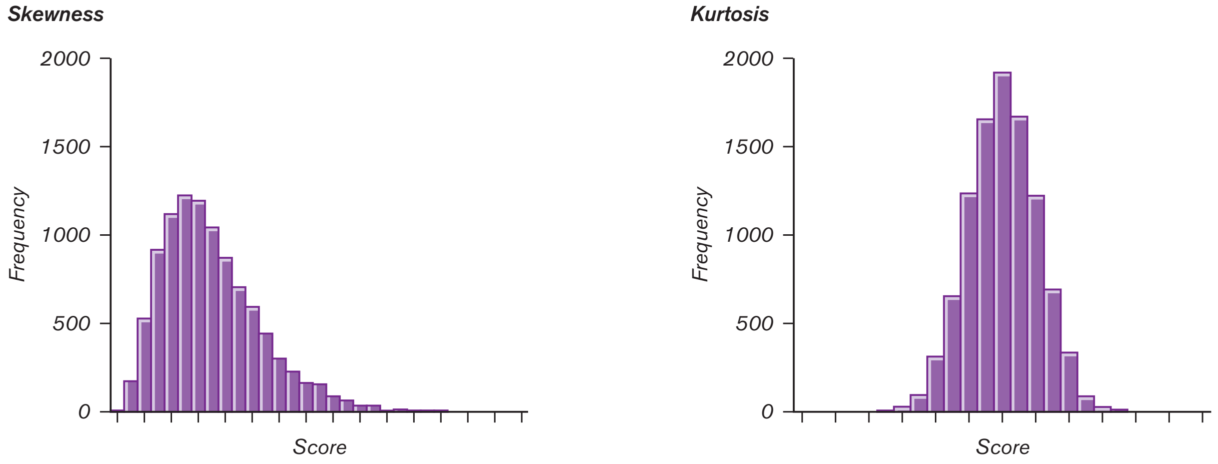


Figure 38.2 The normal distribution (the curve shows the idealised shape of the distribution)

Summarising your data with numbers

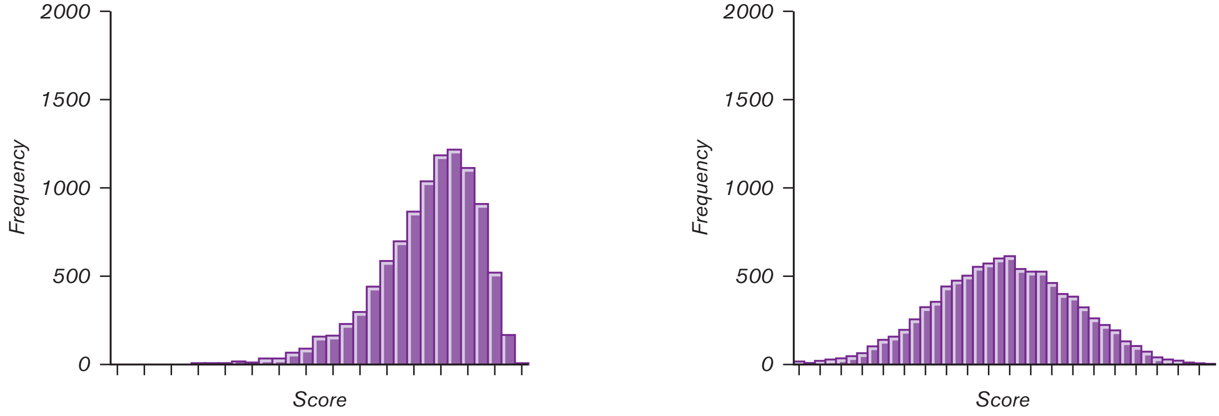
The mode

We have just seen that we can summarise our sample of data using a graph, but we can also summarise it using numbers. When we looked at these distributions, we saw that ideally scores should be clustered around a central point. This being so, the central point should be a value that is consistent with most of the data collected. This is why measures of the centre of the distribution (also called measures of central tendency) are often used as a way of summarising a set of scores. There are several ways to find the centre of a distribution: the simplest is just to look for a score that is typical of the data set, for example, the score most frequently observed. This most common score is called the mode, and its value is often self-evident from the frequency distribution (it is the score with the highest bar). However, to calculate the mode, simply place the data in ascending order (to make life easier), count how many



A positively skewed distribution

A leptokurtic distribution



A negatively skewed distribution

A platykurtic distribution

Figure 38.3

times each score occurs, and the score that occurs the most is the mode!

Thinking back to the data in Class activity box 38.1, there are actually two scores that have the highest bars (22 and 25 seconds). Therefore, this distribution has two modes and is known as a bimodal ('bi' just means 'two') distribution. This illustrates one disadvantage of the mode: there often isn't a single value; in fact, it's possible to have three or more modes (a multimodal distribution) or even more! A second disadvantage is that the mode can be changed dramatically if only a single case of data is added. In Class activity box 38.1, there were two modes, 22 and 25 seconds. Now, imagine we collected data from 1 more child. If this child cried for 22 seconds then the mode would be 22, but if they cried for 25 seconds then the mode becomes 25. This one extra child is making a difference to the mode – this makes it an unrepresentative measure.

The median

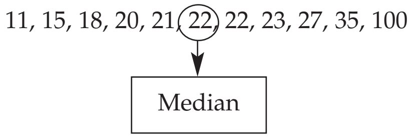
An alternative way to find a score that represents the data set is to look for the middle score when it is ranked in order of magnitude. This is called the median. So, for example, imagine a psychologist was interested in how much students hated their statistics lecturers. They pinned a photo of the resident statistics lecturer to a dartboard and then let a sample of 11 students into the room one at a time and counted how many darts they threw at the photo in 2 minutes.

Number of darts: 20, 35, 100, 15, 22, 27, 18, 11, 21, 23, 22.

To calculate the median, first arrange these scores into ascending order:

Number of darts: 11, 15, 18, 20, 21, 22, 22, 23, 27, 35, 100.

Next, we find the position of the middle score by counting the number of scores we have collected (n), adding 1 to this value, and then dividing by 2. With 11 scores, this gives us $(n + 1)/2 = (11 + 1)/2 = 12/2 = 6$. Then, we find the score that is positioned at the location we have just calculated. So, in this example we find the sixth score:



This works very nicely when we have an odd number of scores (as in this example) but when we have got an even number of scores there won't be a middle value. Imagine the psychologist above replicated her experiment, but put the actual statistics lecturer in the room (not a photo). Again, the number of darts thrown at the lecturer was counted, but this time only 10 students took part in the study.

Number of darts: 30, 44, 137, 25, 32, 36, 28, 21, 38, 33.

Again we arrange these scores into ascending order:

Number of darts: 21, 25, 28, 30, 32, 33, 36, 38, 44, 137.

Again we calculate the position of the middle score as before. With 10 scores, this gives us $(n + 1)/2 = (10 + 1)/2 = 11/2 = 5.5$. This means that the median is halfway between the fifth and sixth scores. To get around this problem, we add these two scores and divide by two (i.e. we take the average). In this example, the fifth score in the ordered list was 32 and the sixth score was 33. We add these together ($32 + 33 = 65$) and then divide this value by 2 ($65/2 = 32.5$). The median in this case is 32.5.

The median has several advantages:

- it is relatively unaffected by extreme scores at either end of the scale (known as **outliers**), so if someone behaves really oddly it won't bias this measure too much
- if the distribution is skewed then the median is less affected by this than the mean
- it can be used with ordinal, interval and ratio data (it cannot, however, be used with nominal data as these data have no numerical order).

However, there are two disadvantages.

1. Behaviours observed in different samples will fluctuate slightly (remember we said earlier on that large samples are more reliable). The median is quite sensitive to these fluctuations, so, if you repeated the same experiment on two samples you'd be likely to see a greater difference between the medians of those samples than the means of those samples.
2. The median is not very useful mathematically because it ignores all but one (or two) of the scores in the data set.

The mean

The mean is the measure of central tendency that you are most likely to have heard of (although you might know it as the *average*). The mean is the sum of all scores divided by the number of scores. To calculate the mean we simply add up all of the scores and then divide by the total number of scores we have. We can write this in equation form as:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

This may look complicated, but the top half of the equation simply means 'add up all of the scores' (the x_i just means 'the score of a particular person', we could replace the letter i with their name instead), and the bottom bit means divide this total by the number of scores you have got (n).

Let's take the data on the number of darts thrown (by the 10 students) for which we calculated the median. To calculate the mean, we first add up all of the scores.

$$\sum_{i-1}^{n} x_i = 30 + 44 + 137 + 25 + 32 + 36 + 28 + 21 + 38 + 33$$

$$= 424$$

We then divide by the number of scores (in this case 10).

$$\bar{x} = \frac{\sum_{i-1}^{n} x_i}{n} = \frac{424}{10} = 42.4$$

The mean is 42.4, which is not a value we observed in our actual data (no-one threw 42.4 darts). Interestingly, this value is a lot higher than the median (the median was 32.5). The reason for this is, as was pointed out earlier, the median isn't heavily affected by extreme scores. Well, one disadvantage of the mean is that it can be influenced by extreme scores. In this case there was one person who threw 137 darts, which is a lot more darts than everyone else threw. This has biased the mean (see Class activity box 38.2). The other downsides of the mean are that it is affected by skewed distributions and can be used only with interval or ratio data.

Nevertheless, the mean has important advantages. The mean uses every score (the mode and mean ignore most of the scores in a data set) and is the summary of the data with the least error (see Field and Hole, 2003). However, most important is that the mean is resistant to sampling variation. Basically if you took one sample from a population and measured the mean, mode and median; and then took a different sample from the same population and again measured the mean, mode and median, then the mean is the most likely of the three measures to be the same in the two samples. This is very important because psychologists usually use samples to tell them about the entire population. Therefore, it's unhelpful to use measures that differ from sample to sample because it means that the answers you get depend on the sample you happen to have used!

Self-test: What are the relative benefits and costs of the mean, mode and median as measures of central tendency?

How good is my measure of central tendency?

The mode, median and mean are simple statistical models – if no other data were available, and we were asked to predict a given person's score, they would be the best guess we could make. It's important with any model that it accurately represents the state of the real world. For example, you wouldn't build a tower block without first constructing many scaled-down models of the building and sticking them in wind tunnels to make sure they don't fall over, would you? If you were building a tower block, it would be essential that the test models behave in the same ways as the real building will do, otherwise the tests on the model are inaccurate and pointless. We can draw a direct parallel to statistics: imagine the population is the tower block, the sample is a scaled-down version of the population and we use it to build models (like the scaled-down models of the tower block). It's important that these models are accurate otherwise the inferences we draw about the population (or building) will be inaccurate.

This section really looks at ways we can assess how accurate our summaries of the data are. Put simply, the summaries we have come across all measure the centre of the distribution of scores. As such, if the scores lie close to the centre then the centre of the distribution will be a good summary of how most people behaved (because most scores are indeed close to that central point). However, if scores are very spread out (some are high above the centre and some are far below it) then the centre of the distribution won't be a good summary of how people behaved because some people produced data points that were very far away from the mean. Therefore, to measure how good our summary of the data is, we need to assess how spread out the data are. This is known as variability.

CLASS ACTIVITY BOX 38.2

Calculating medians and means

I've talked in the text about how extreme scores (outliers) can influence the mean more than the median. As a way of practising calculating these statistics, and to illustrate a point, let's try recalculating the data for the example of the number of darts thrown at the stats lecturer. The original data were:

Number of darts: 30, 44, 137, 25, 32, 36, 28, 21, 38, 33.

We calculated a median of 32.5, and a mean of 42.4.

Let's now exclude the extreme score of 137, so our data are:

Number of darts: 30, 44, 25, 32, 36, 28, 21, 38, 33.

Before you read on, calculate the median and median of these data (remember there are now 9 scores, not 10 as before!).

Answers

For the median, we re-order the data: 21, 25, 28, 30, 32, 33, 36, 38, 44. Then calculate the position of the median: $(n + 1)/2 = (9 + 1)/2 = 10/2 = 5$. So, the median is the fifth number, which for these data is 32. Bear in mind, the median we calculated before (when the outlier was included) was 32.5, the value without this extreme value is very similar.

For the mean we add the scores: $21 + 25 + 28 + 30 + 32 + 33 + 36 + 38 + 44 = 287$. We then divide this by the number of scores, 9: $287/9 = 31.89 = 32$. Bear in mind, the mean we calculated when the outlier was included was 42.4, the value without this extreme value has fallen dramatically. This illustrates how the mean is affected by extreme scores. Another way to view this is that when the extreme score is excluded, the median and mean are the same (both are 32), but when one extreme score is added it drags up the mean (to 42.4) but, basically, doesn't affect the median!

Let's look at an example. Amazon is an internet company selling CDs, books and just about anything else. For any product customers can write reviews and rate the product on a scale from 1 (very bad) to 5 (excellent). I looked up the customer ratings for two albums: Britney Spears' 'Britney', and Fugazi's 'In on the Killtaker' (which, by the way, is one of the greatest albums ever made!). Figure 38.4 shows the ratings of each customer along with the mean rating (displayed as a horizontal line). The first thing to notice about these graphs is that for Britney's album customers are divided: they either loved it (and gave it 5) or hated it (and gave it 1), there are very few people between the two extremes! For Fugazi, however, the ratings are universally very high (most are 5s, with only a few 4s and 3s and no 2s and 1s). Now, let's look at the means. For Fugazi the mean is very close to nearly all of the scores – because the data are not very spread out it is a fairly accurate representation of most people's scores (most of the dots are not too far from the line). Looking at the mean for Britney, this line doesn't really represent anyone much (the dots are all very far from the line) because the data are very spread out around this central point. So, the mean is a lot lower than all the people who loved the album, and a lot higher than those who hated the album! Hopefully, these rather extreme examples illustrate that the variability in data tells us something about whether the measure of central tendency (in this case the mean) is accurate or not.

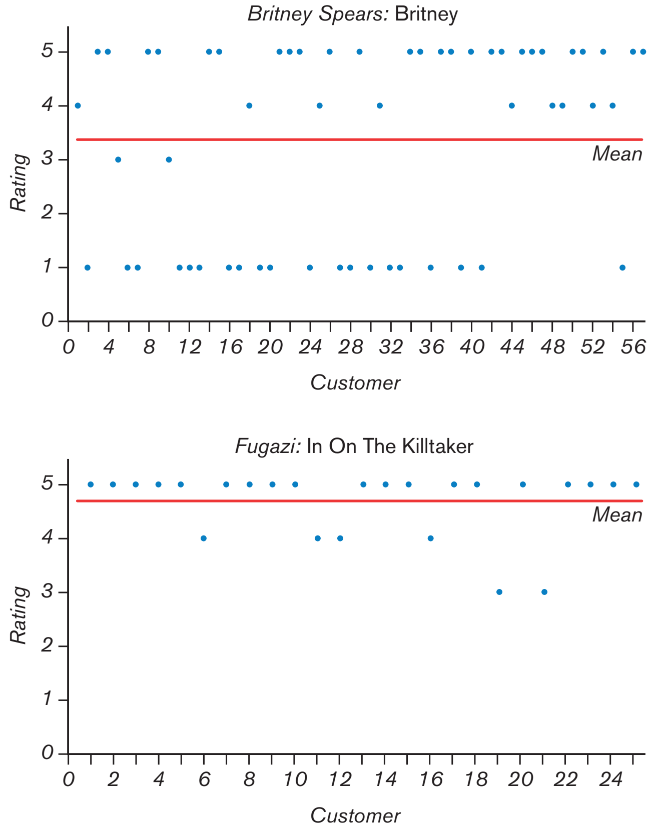


Figure 38.4 The top graph shows the customer ratings from Amazon.co.uk for Britney Spears's album Britney, whereas the bottom graph is distribution of customer ratings from Amazon.com for Fugazi's masterpiece In on the Killtaker

The range

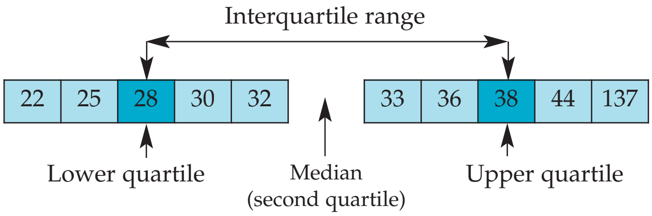
The easiest way to look at variability is simply to calculate the range of scores. To do this, take the highest score that you observed and from it subtract the lowest score. Let's go back to the data about the number of darts thrown at the statistics lecturer. Remember that if we order these scores we get 21, 25, 28, 30, 32, 33, 36, 38, 44, 137. The highest score is 137 and the lowest is 21, therefore, the range is $137 - 21 = 116$.

One problem with the range is that because it uses only the highest and lowest score it is affected dramatically by outliers. For example, with these data, the person who threw 137 darts is somewhat unusual (anger management clearly needed!) given that the next highest score was 44. What would the range be if we'd never tested our psychopath dart thrower? The highest score would be 44, and the lowest would still be 21, so the range would be $44 - 21 = 23$. This is a dramatic reduction – about a fifth of the size.

One way around this problem is to calculate the range when we exclude values at the extremes of the distribution. One convention is to cut off the top and bottom 25% of scores and calculate the range – known as the interquartile range. Let's do this with the dart throwing data. First we need to calculate what are called quartiles. Quartiles are values that split the data into four equal parts. The calculation of these is similar to how we calculated the median. First, arrange the scores into ascending order (if you haven't done so already):

Number of darts: 21, 25, 28, 30, 32, 33, 36, 38, 44, 137

Next, we split the data in half using the median. We've already calculated this on page 571 and it was 32.5. We split the data at this point, which gives us two halves. We then calculate the median of the lower half. The lower half has 5 scores, so the median is the $(n + 1)/2 = 6/2 = 3$rd score. The third score in the lower half is 28. This value is the lower quartile. We then do the same for the top half of the scores. Again, this half has 5 scores, so the median will be the 3rd score in this top half, which is 38. This is the value of the upper quartile. We can think of this process as in the diagram:



Therefore, the lowest score to the value of the lower quartile should contain the lowest 25% of scores; the value of the upper quartile up to the highest score should contain the top 25%; and the lower quartile to the upper quartile should contain the middle 50% of the data. The interquartile range is simply the range when you ignore the upper and lower quartile: put another way it's the value of the upper quartile minus the value of the lower quartile (in this case it would be 38 − 28 = 10). The advantage of the interquartile range is that it isn't affected by extreme scores at either end of the distribution. However, the problem with it is that you lose a lot of data (half of it in fact!). Also cutting off the upper and lower 25% of scores is completely arbitrary (why not the top and bottom 10% or 5%?).

Variance

A more sophisticated way to measure the spread of data is to use all of the scores you have collected and look at how different they are from the centre of the distribution (this is known as the deviation). I'm getting a bit tired of the dart example, so let's imagine the organisers of the Download music festival were interested in how many bands the average punter sees during their three days there (there are over 100 bands playing). (In the unlikely event that you don't know what I'm talking about, it's a great three-day heavy rock music festival held at Donington race track in June most years.)

The data are presented in Figure 38.5, which shows the number of bands that each of six festival goers saw during the festival, and also the mean number (which as it turns out is 10). The diagram has a series of vertical lines that connect each observed value to the mean. If we use the mean as our summary or modal of the data, then these lines represent the differences between what our model predicts (the mean) and the data we actually collected; these differences are the deviations. The magnitude of these differences is calculated by subtracting the mean value ($\bar{X}$) from each of the observed values (x_i). For example, the first festival goer saw 12 bands and so the difference is $x_1 - \bar{X} = 12 - 10 = 2$. The fact that the difference is a positive number tells us that our model underestimates the number of bands that this person saw: it predicts that he or she saw 10 bands when he or she actually saw 12. The simplest way to use these deviations to estimate the accuracy of the model would be to add them (this would give us an estimate of the total error). If we were to do this we would find that the total deviations add up to zero, as in Table 38.1.

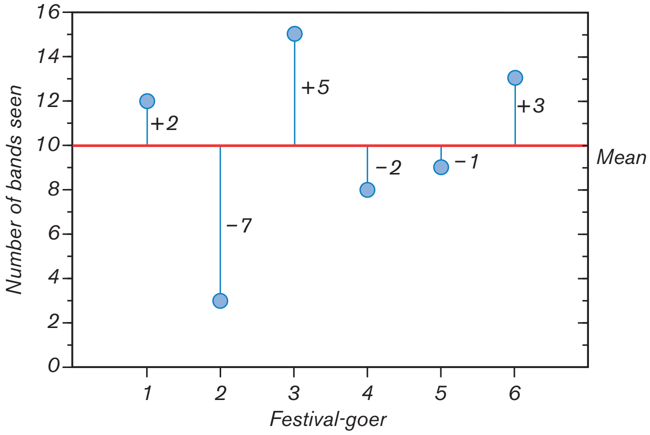


Figure 38.5

The fact that the total of all deviations is zero implies that there is no error within the model, or put another way, the mean is a perfect way to predict how many bands people saw. This clearly isn't true because we know that scores deviate from the mean. The reason why the sum of all deviations equals zero is that the mean measures the centre of the distribution. Therefore, about half of the scores are greater than the mean and about half are less. Consequently, about half of the deviations will be positive and about half will be negative and when we add them up, they cancel each other out! To overcome this problem we square each of the deviations (see Table 38.2) so that they are all positive (the negative ones become positive when squared because you are multiplying two negative numbers).

TABLE 38.1 TOTAL DEVIATIONS ADD UP TO ZERO

Raw score x_i	Mean $\bar{x}$	Deviation $(x_i - \bar{x})$
12	10	2
3	10	−7
15	10	5
8	10	−2
9	10	−1
13	10	3
		$\Sigma(x_i - \bar{x}) = 0$

If we add the squared deviations we get the sum of squared deviations, which is more commonly referred to as the sum of squared errors (or sum of squares for short). In itself, the sum of squared errors is a good measure of the accuracy of the mean. However, because it is a summed value, it will get bigger if we collect more data. So, if we collected data from another 6 festival goers our sum of squares will probably get about twice as large. This makes it difficult to compare across different sets of data. Therefore, we need to take account of the number of scores on which the sum of squared deviations is based. The obvious way to do this is just to divide by the number of scores (N) to get the mean squared error. In fact, if we're interested only in the average error for the sample, then this is exactly what we do. However, we are generally interested in using the error in the sample to estimate the error in the population and so we actually divide the sum of squares by the number of observations minus 1 (if you are interested in why then read Field and Hole, 2003, Chapter 4). This measure is known as the variance:

$$s^2 = \frac{SS}{N-1} = \frac{\sum (x_i - \bar{x})^2}{N-1} = \frac{92}{5} = 18.4$$

The variance tells us on average how much a given data point differs from the mean of all data points. This makes it an incredibly useful measure because we can compare it across samples that contain different numbers of observations. However, by using squared data we change the units of measurement. So, for these data we couldn't say that the average deviation was 18.4 bands, we'd have to say it was 18.4 bands squared! It makes very little sense to talk about band squared (try squaring a band and see how upset they get!). More commonly we'd convert the average error back into the original units of measurement by taking the square root of the variance; this measure is known as the standard deviation. In this example the standard deviation is:

$$s = \sqrt{18.4} = 4.29$$

The sums of squares, variance and standard deviation are all measures of the same thing: the variability of the data. Bearing in mind that the mean will be most accurate when the scores are similar, and will be most inaccurate when the scores are very different, they also tell us about the accuracy of the mean as a summary of the data. These measures are all proportionate: if one value is large then all of the others will be too. Small standard deviations relative to the value of the mean indicate that data points are close to the mean and large standard deviations (relative to the mean) indicate that the data points are distant from the mean. Now look at Class Activity Box 38.3.

Self-test: What is the difference between the sum of squared errors, the variance and the standard deviation of a data set?

The standard deviation and the shape of the distribution

As well as telling us about the accuracy of the mean as a model of our data set, the variance and standard deviation also tell us about the shape of the distribution of scores. If the mean represents the data accurately then most of the scores will cluster close to the mean and the resulting standard deviation is small relative to the mean. When the mean is a less accurate representation of the data, the scores cluster more widely around the mean (see Figure 38.4) and the standard deviation is larger. Figure 38.6 shows two distributions that have the same mean (50) but different standard deviations. One has a large standard deviation

TABLE 38.2 SQUARE EACH OF THE DEVIATIONS

Raw score X_I	**Mean** $\bar{X}$	**Deviation** $(X_I - X^{-})$	**Squared deviation** $(X_I - X^{-})^2$
12	10	2	4
3	10	−7	49
15	10	5	25
8	10	−2	4
9	10	−1	1
13	10	3	9
		$\Sigma(x_i - x^{-}) = 0$	$\Sigma(x_i - x^{-})^2 = 92$

CLASS ACTIVITY BOX 38.3

Calculating standard deviations

Use the customer ratings for Fugazi 'In on the Killtaker' and calculate the standard deviation! You can read the ratings from Figure 38.4, but to save your eyesight they are:

Customer ratings: 5, 5, 5, 5, 5, 4, 5, 5, 5, 5, 4, 4, 5, 5, 5, 4, 5, 5, 3, 5, 3, 5, 5, 5, 5

Answers

First we calculate the deviations and square them:

Raw Score x_i	Mean $\bar{x}$	Deviation $(x_i - \bar{x})$	Squared Deviation $(x_i - \bar{x})^2$
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
4	4.68	-0.68	0.4624
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
4	4.68	-0.68	0.4624
4	4.68	-0.68	0.4624
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
4	4.68	-0.68	0.4624
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
3	4.68	-1.68	2.8224
5	4.68	0.32	0.1024
3	4.68	-1.68	2.8224
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
			$\Sigma(x_i - \bar{x})^2 = 9.44$

Once we have added up the squared deviations (= 9.44), we divide this value by $N - 1$. There are 25 ratings, so we get $9.44/24 = 0.393$. This is the variance. We then take the square root of this to get the standard deviation ($\sqrt{0.393} = 0.627$). Now have a go with the Britney ratings!

relative to the mean (*SD* = 25) and this results in a flatter distribution that is more spread out. The other has a small standard deviation relative to the mean (*SD* = 15) resulting in a more pointy distribution in which scores close to the mean are very frequent but scores further from the mean become increasingly infrequent. The main message is that as the standard deviation gets larger, the distribution gets fatter.

z-scores: what are they good for?

Another way to look at frequency distributions is in terms of probability: they give us some idea of how likely a given score is to occur. Think back to the little Albert example in Class activity box 38.1 and the frequency distribution that we drew. If someone was to ask you 'how likely is it that a child in this experiment cried for less than 10 seconds?', what would your answer be (look at the frequency distribution)?

The chances are you will respond 'not very likely' because you can see from the graph that only 3 children out of the 50 that were tested cried for less than 10 seconds. What about if someone asked 'How likely is it that a child in this experiment cried for 25 seconds or more?' Again, by looking at the graph, you might say 'it's actually quite likely' because 21 out of the 50 children cried for that amount of time (that's nearly half of them). Looking at this a slightly different way we can work out the probability that a particular score will occur. So, we could ask, based on our data, what's the probability of a child crying for 6 seconds? A probability value can range from 0 (there's no chance whatsoever of the event happening) to 1 (the event will definitely happen). So, for example, the publishers of this book set me a deadline for finishing this chapter and they obviously want to know the probability of me meeting this deadline. When I talk to them I would say the probability is 1: I will definitely have completed the chapter by Friday 1 August 2007. However, when I talk to my girlfriend I might, more realistically, tell her that there's a .25 probability of me finishing the chapter (or put another way a 25% chance, or 1 in 4 chance that I'll complete it in time). Of course, in reality, the probability of me meeting the deadline is 0 because I never manage to meet publishers' deadlines! If probabilities don't make sense to you then just ignore the decimal point and think of them as percentages instead (i.e. .25 probability that something will happen = 25% chance).

So far we have looked in fairly vague terms about how we could use frequency distributions to get a rough idea of how likely a given score is to occur. Most of the time in science it's not good enough to be vague: we need precise estimates. For any distribution of scores we could, in theory, calculate the probability of obtaining a score of a certain size. However, it would be incredibly tedious to have to do this every time we collected some data. Therefore, statisticians have identified several common distributions. For these distributions they have worked out tables of the probabilities of getting particular scores based on the frequencies with which a particular score occurs in a distribution of a particular shape. One of these 'common' distributions is the normal distribution (see Figure 38.2). With this particular distribution, statisticians have calculated the probability of certain scores occurring in a normal distribution with a mean of 0 and a standard deviation of 1. Therefore, if we have any data that are

TABLE 38.3 CALCULATE THE DEVIATIONS AND SQUARE THEM

Raw score x_i	Mean $\bar{x}$	Deviation $(x_i - \bar{x})$	Squared deviation $(x_i - \bar{x})^2$
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
4	4.68	−0.68	0.4624
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
4	4.68	−0.68	0.4624
4	4.68	−0.68	0.4624
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
4	4.68	−0.68	0.4624
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
3	4.68	−1.68	2.8224
5	4.68	0.32	0.1024
3	4.68	−1.68	2.8224
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
5	4.68	0.32	0.1024
			$\Sigma(x_i - \bar{x})^2 = 9.44$

shaped like a normal distribution then if the mean and standard deviation are 0 and 1 respectively then we can use the tables of probabilities for the normal distribution to see how likely it is that a particular score will occur in the data. The obvious problem is that not all of the data we collect *will* have a mean of 0 and standard deviation of 1. For example, we might have a data set that has a mean of 75 and a standard deviation of 13.24! Luckily it is easy to convert any data set into a data set that *does* have a mean of 0 and a standard deviation of 1. All we have to do is take each score and subtract from it the mean of all scores (this centres the data set around 0), and then divide the resulting score by the standard deviation (this ensures that resulting data have a standard deviation of 1). The resulting scores are known as *z*-scores and in equation form, the conversion I've just described looks like this:

$$z = \frac{x_i - \bar{x}}{s}$$

Let's go back to our data about the number of bands that people saw at the Download festival. We worked out that these data had a mean of 10 and a standard deviation of 4.29. Let's calculate the corresponding *z*-scores, as in Table 38.4.

Self-test: Now, try calculating the mean and standard deviation of these *z*-scores: you should get a mean of 0 and a standard deviation of 1!

The table of probability values that have been calculated for the normal distribution (with a mean of 0 and standard deviation of 1) is shown in the appendix. Why is this table important? Well, if we look at our person who saw 15 bands at Download, we can answer the question 'what's the probability that someone saw 15 or more bands' by finding the corresponding *z*-score (1.166 or 1.17 when rounded off) in the appendix and looking at the value in the column labelled 'smaller portion' (i.e. the area above the value 1.166). You should find that the probability is .121, or put another way, only

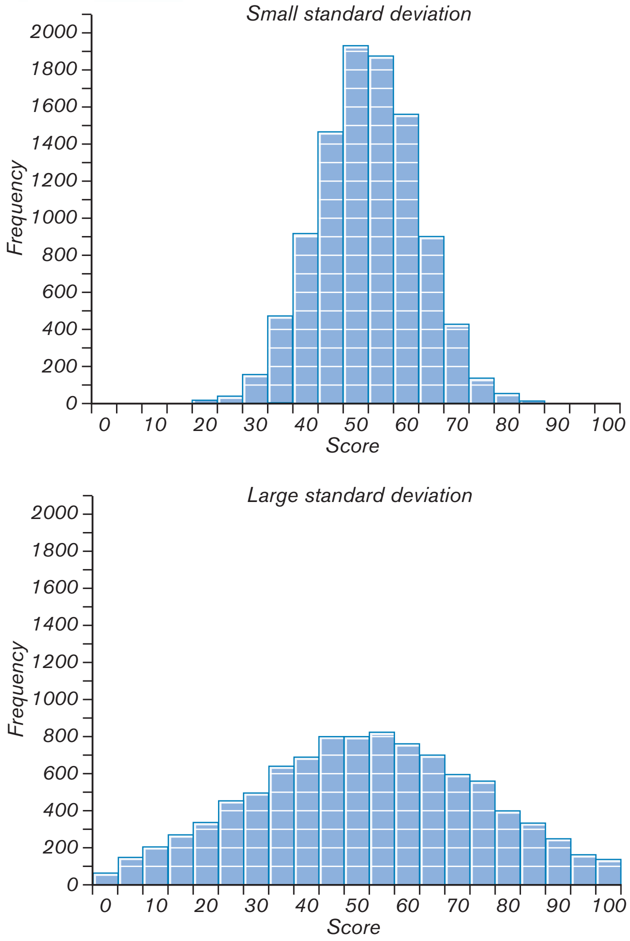


Figure 38.6 Two distributions that have the same mean but different standard deviations

a 12.1% chance that someone saw 15 or more bands. By looking at the column labelled 'bigger portion' we can also see the probability that someone saw 15 or fewer bands! This probability is .879, or put another way, there's an 87.9% chance that someone at Download saw 15 or fewer bands!

Hopefully you can see from these examples that the normal distribution, and *z*-scores allow us to go a first step beyond our data in that from a set of scores we can calculate the probability that a particular score will occur. So, we can see whether scores or a certain size are likely or unlikely to occur in a distribution of a particular kind. You'll see just how useful this is in the next chapter!

Reporting data

So far we have seen various ways to summarise data so that we can easily communicate our findings to other psychologists and scientists. This section looks at how to present these summaries and in general terms we have a choice of either reporting these summaries in words or graphically.

Reporting data in words

When we present the summaries of central tendency (the mean, mode and median) we usually will include information about the accuracy of that statistic. So, we might simply report the mean followed by the standard deviation. However, we sometimes report other things such as the standard error and confidence intervals, which are described in the next chapter. For the time being don't worry about what these things are (you'll find out in due course) – because I just want to give you a flavour of how data can be presented. As a psychologist, if you have collected some data and found a result that is interesting to other psychologists, then you'll typically write up a report to be published in an academic journal. Journals are just like magazines (only usually more boring) that contain articles from scientists. These articles are usually either in the form of an empirical report (where a scientist has tested some theory using the types of techniques we have discussed and written up the results), or are a review paper (in which a scientist appraises a body of research that has addressed the same research question). When these articles are submitted to a journal, they are almost always sent to other experts in the field, who assess the work on its quality and importance to the field. For the paper to be accepted to the journal and subsequently published, these

TABLE 38.4 CALCULATE THE CORRESPONDING Z-SCORES

Raw score X_I	Mean $\bar{X}$	Deviation $(X_I - \bar{X})$	Standard deviation (S)	$z = \frac{(x_i - \bar{x})}{S}$
12	10	2	4.29	0.466
3	10	−7	4.29	−1.632
15	10	5	4.29	1.166
8	10	−2	4.29	−0.466
9	10	−1	4.29	−0.233
13	10	3	4.29	0.699

experts have to have deemed the work to be methodologically rigorous and important.

When submitting manuscripts to journals for consideration, results have to be summarised in a standard way, and many psychology journals have adopted the conventions laid out by the American Psychological Association (or APA for short) in its publications manual, which is now in its fifth edition (APA, 2001). Usually, we report any numbers to two decimal places and there are various standard abbreviations for statistical values:

- *M* = Mean
- *Mdn* = Median
- *SE* = Standard error
- *SD* = Standard deviation

Let's have a look at some examples of how to report a mean and the associated standard error in correct APA format. It's most common to parenthesise both the mean and standard error within a sentence that would otherwise make sense even if these parenthesised values were excluded:

- Men (*M* = 10.94, *SE* = 4.32) urinated on the toilet seat substantially more than women (*M* = 2.07, *SE* = 0.52).
- Peanut consumption increased dramatically after alcohol (*M* = 500.67, *SE* = 42.39) compared to before (*M* = 36.89, *SE* = 8.29).

There may also be times when you want to report the median, and in these cases you should also report the range of scores or the inter-quartile range.

- Dogs sniff people's groins (*Mdn* = 37, *Range* = 20–89) more than cats (*Mdn* = 3, *Range* = 0–5).
- Cats stick their claws into their owner's groin (*Mdn* = 62, *Range* = 40–102) more than dogs (*Mdn* = 40, *Range* = 18–63).

Self-test: A scientist measured happiness after people had logged onto Facebook. They found that if people had had a new friend request since the last time they logged on, their mean happiness was 7.34, the median was 7, the standard deviation was 2.13 and the lowest score was 2 and the highest 10. If they had not had a friend request since their last login, their mean happiness was 5.67, the median was 5, the standard deviation was 1.82 and the lowest sore was 0 and the highest 9. Report these findings in APA format.

Graphing means

The second approach is to report means and medians by using a graph and then not report the actual values in the text. The choice of using a graph or writing the values in the text largely depends on what you want to report. If you just have one or two means you might decide that a graph is superfluous, but when you have lots of means to report, a graph or a table can be a very useful way to summarise the data. In this section we'll look at how to graph means, before moving onto looking at what to do if you want to report the median.

If you do use a graph then you shouldn't really report values in the text as well because the reader should be able to use the graph to get the values for themselves. Means can be displayed either with a bar chart or a line chart, but in both cases it is very important to include error bars, which are bars that indicate the variability within the data. Figure 38.7 shows an example of a bar chart showing the mean number of times (per week) that men and women urinated on toilet seats; the gender of the person is displayed as different bars and each bar represents the mean, but each mean is also spanned by a funny 'I' shape; this is called an error bar.

Error bars can represent the standard deviation of the sample, the standard error estimated from the sample, or a confidence interval for the mean. The error bars in Figure 38.7 display the 95% confidence interval, which we'll come across in the next chapter. All I'll say at this stage is that this tells us something about the mean in the population. Actually, if we were to take 100 samples from a population and calculate the mean and confidence interval for each sample then 95 of those 100 intervals would contain the true value (i.e. the population mean). This statistic is incredibly

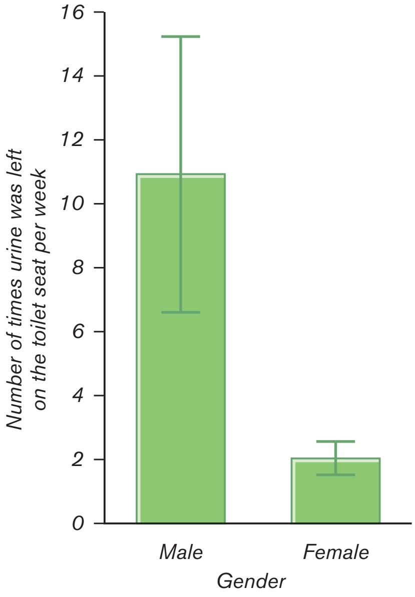


Figure 38.7 Graph of two means (with error bars)

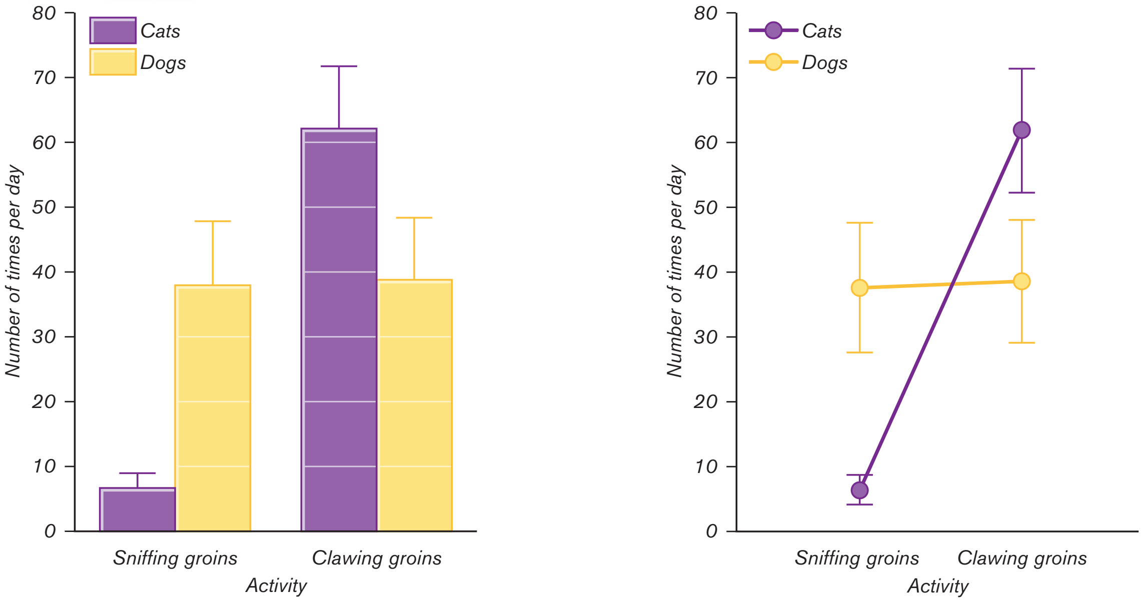


Figure 38.8 A line graph and a bar chart of the same data

useful: if the confidence interval is small, then it means that the likelihood is that the population mean is similar to the one in our sample. Conversely, a large confidence interval would mean that the mean in the population is likely to be very different to the one in our sample! *So, small error bars are good, large error bars are bad!*

Figure 38.8 shows how both line charts and bar charts can be used to present the same data. However, use one or the other: *never display the same data with two different charts!* Also, if you do a line chart, don't be tempted to superimpose bars on it, or conversely don't superimpose a line chart over bars: this is completely pointless and just overcomplicates the graph! The charts in Figure 38.8 show the number of times cats and dogs engage in two different activities: sniffing groins, or sticking their claws into them! The task engaged in is shown on the *x*-axis (the horizontal), but because we have more than one animal (we have cats and dogs) we can represent these activities as different lines, or bars. We have four means in total and each one has an error bar, and in the line chart we use the lines to connect means that relate to the same animal, and in the bar chart we use different coloured bars to represent the different animals.

These charts allow us to examine different patterns in the data for different activities. If we look at groin sniffing first, we can see that dogs engage in rather a lot of it whereas cats do not. This is because dogs are foul animals that love to stick their noses where others wouldn't dare, unlike cats, which have far more sense. If we look at sticking claws into groins then the pattern is reversed: cats love nothing more than to test their owner's love for them by sticking their razor sharp claws in the most sensitive area of their owner's anatomy (but we still love them, fools that we are!) whereas dogs are nice loyal creatures that protect rather than harm their owners (hmm, I'm thinking of trading the cat in now that I think about this . . . .). These graphs should highlight how useful charts can be to show trends in the data.

Graphing medians

Typically if you want to graph the median, then you don't use a bar chart or a line chart (but that's not to say you can't!). Instead you use something called a boxplot, or box whisker diagram to give it its full name. Figure 38.9 shows such a graph of the number of grams of peanuts eaten by two groups of students: one group had drunk alcohol, whereas the other group were sober. There are several important features of this graph: namely a box and two whiskers! The box shows the interquartile range that I described earlier, so 50% of the scores are bigger than the lowest line of the box (which shows the value of the lower quartile) but smaller than the top line of the box (which shows the value of the upper quartile). You'll also notice another horizontal line within the box; this line shows the value of the median. The box also has two whiskers: one sticking out of the top, and one sticking out of the bottom. The top line of the whisker that sticks out of the top of the box shows the highest score, therefore, the distance between the top edge of the box and the top of the upper whisker shows the range within which the top 25% of scores fall. Conversely, the line at the bottom of the lower whisker shows the lowest score; therefore, the distance between the horizontal line at the bottom of the lower whisker and the lower edge of the box represents the range within which the bottom 25% of scores fall. Finally, the distance between the

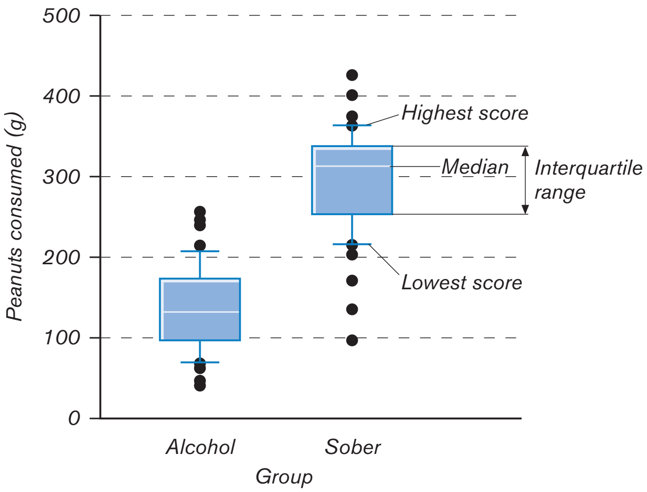


Figure 38.9 A boxplot (or box whisker diagram) of the quantity of peanuts eaten after alcohol and when sober

horizontal line at the top of the upper whisker and the horizontal line at the bottom of the lower whisker represents the range of scores. Now, I hear you ask, 'what are those strange black blobs'? They are outliers or extreme scores. When you plot boxplots with a computer package, they generally, identify extreme scores for you and display them as dots above and below the whiskers!

Graphing relationships

Sometimes you won't want to display means or medians of different groups of people, but instead display relationships between variables. Imagine we wanted to test the proverb 'too many cooks spoil the broth', we could collect data about the quality of broth (by getting people to rate it on a scale of 1–10) and also find out how many cook's were involved in the preparation. Now, we're looking for a relationship between the number of cooks and the quality of the broth. If we just calculated the mean rating of broth for each number of cooks (or the mean number of cooks for each rating of broth) then we could end up with a lot of averages. Instead, we can just plot all of the data on a graph. If we plot the number of cooks on the x-axis and the corresponding rating of both on the y-axis (or vice versa), then we can look at the relationship between these variables very easily. This type of graph is known as a scatterplot.

A scatterplot is simply a graph that plots a score on one variable against the corresponding score on another (and a corresponding score on a third variable can also be included on a 3-D scatterplot). A scatterplot tells us many things about the data such as whether there is a relationship between the variables, what kind of relationship it is and whether any cases look like outliers.

Now, imagine we collected data about how long the broth took to prepare. We'd have three variables: the number of cooks, the time spent preparing (in minutes), and the quality of the broth (as a percentage score). Figure 38.10 shows three scatterplots depicting the various relationships between these variables. The top graph shows that as the number of cooks increases, the ratings of the broth decreases. This is known as a *negative* or *inverse* relationship. That is, as one variable changes in one direction, the other variable changes in the opposite direction (as the number of cooks increases, the quality of the broth decreases, or it would be equally correct to say as the quality of the broth increases, the number of chefs decreases!). So, too many cooks do indeed seem to spoil the broth. The second graph shows the relationship between the time spent preparing the broth, and the quality of the broth. This shows that as the time spent preparing the broth increases, the ratings of the broth also increase. This is known as a *positive* relationship: as one variable changes in one direction, the other variable changes in the same direction (as the time spent preparing the broth increases, the quality of the broth increase, or it would be equally correct to say as the quality of the broth increases, the time spent preparing increases, and in fact you could also say that as time spent preparing the broth decreases, the quality of the broth decreases!). So, taking time to prepare the broth appears to be beneficial. The final scatterplot shows the relationship between the number of cooks and the time taken to prepare the broth. This shows no relationship at all: as one variable changes in a particular direction, the other variable stays the same. So, as the number of cooks increases (or decreases) the time taken to prepare the broth doesn't change much at all.

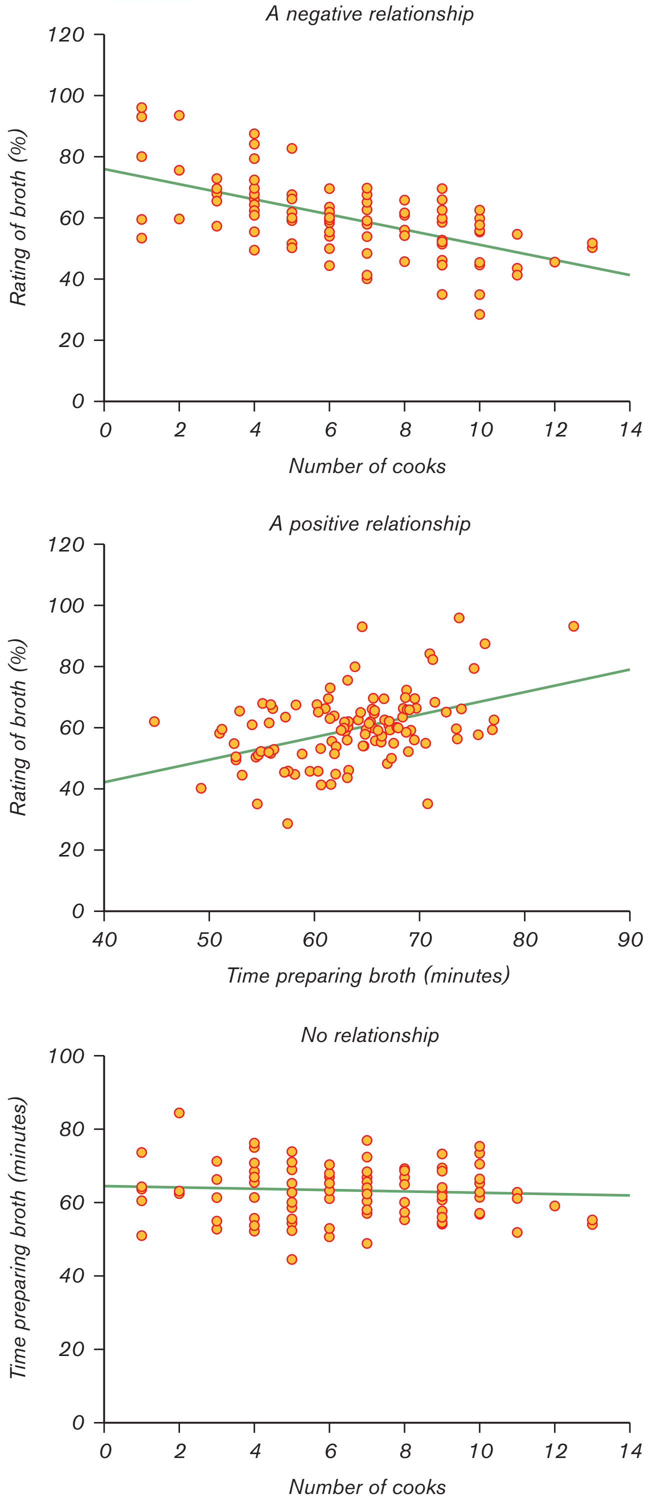
As you can see, there's an awful lot we can tell from a scatterplot and they're extremely useful graphs. You'll notice on all of these graphs that there is a line that summarises the pattern of data (a line that is an approximation of the general trend shown by the dots). This is called the line of best fit, or regression line, and we'll find out more about it in the next chapter.

Self-test: For each of the following describe what statistical properties of a data set can be displayed: bar chart, line chart, scatterplot, boxplot.

How not to graph data

So far I've shown you some of the different graphs that can be used to display data. In this final section I want to highlight some points about good graphing practice. The advent of computers has allowed people to spend vast amounts of time producing very snazzy looking graphs, but I hope to convince you that snazzy is not always best! Tufte (2001) has written an excellent text about how data should be presented. He points out that graphs should do, among other things, the following:

- show the data
- induce the reader to think about the data being presented (rather than some other aspect of the graph, like how nice the colour scheme is)



A negative relationship

A positive relationship

No relationship

Figure 38.10 Scatterplots showing the relationships between the number of cooks, the preparation time and the quality of broth

- avoid distorting the data
- present many numbers with minimum ink!
- make large data sets coherent
- encourage the reader to compare different pieces of data
- *reveal* data.

However, graphs often don't do these things. Let's look at a few examples of some bad graphs.

Unnecessary whistles and bells

Fortunately, from the point of view of copyright and offending other people, one of the most truly appalling examples of bad graphics was done by some gibbering imbecile called 'Andy Field' in the first edition of his book *Discovering Statistics . . .* (2000). It's a graph showing the mean number of obsessive thoughts and behaviours experienced by groups of people suffering from obsessive compulsive disorder (see Chapter 35) after three types of therapy: cognitive behaviour therapy (CBT), behaviour therapy (BT) and no treatment (see Chapter 36 to find out about these therapies). Figure 38.11 reproduces this graph and shows an alternative display of these data. What's wrong with the original?

- *The bars have a 3-D effect:* Never use 3-D on a 2-D graph because all it does is obscure the data. In particular it makes it hard to see the values of the bars because of the 3-D effect. This graph is a great example because the 3-D effect makes the error bars almost impossible to read.
- *Patterns:* The bars also have patterns, which although very pretty, merely distract the eye from what matters (namely the data). These are completely unnecessary!
- *Cylindrical bars:* what's that all about eh?
- *Badly labelled y-axis:* 'number' of what . . . delusions? Fish? Cabbage eating sea lizards from the eighth dimension? Idiots who don't know how to draw graphs?

Now, take a look at the redone version. What improvements have been made?

- *2-D:* The completely unnecessary third dimension is gone making it much easier to compare the values across therapies and thoughts/behaviours.
- *The y-axis has a more informative label:* we now know that is was the number of obsessive thoughts or actions per day that was being measured.
- *Distractions:* There are fewer distractions like patterns, cylindrical bars and the like!

Tufte (2001) actually goes a step further and recommends trying to minimise the amount of ink used to present data. Figure 38.12 shows the kind of thing that Tufte might recommend: it's a redrawn version of the boxplot in Figure

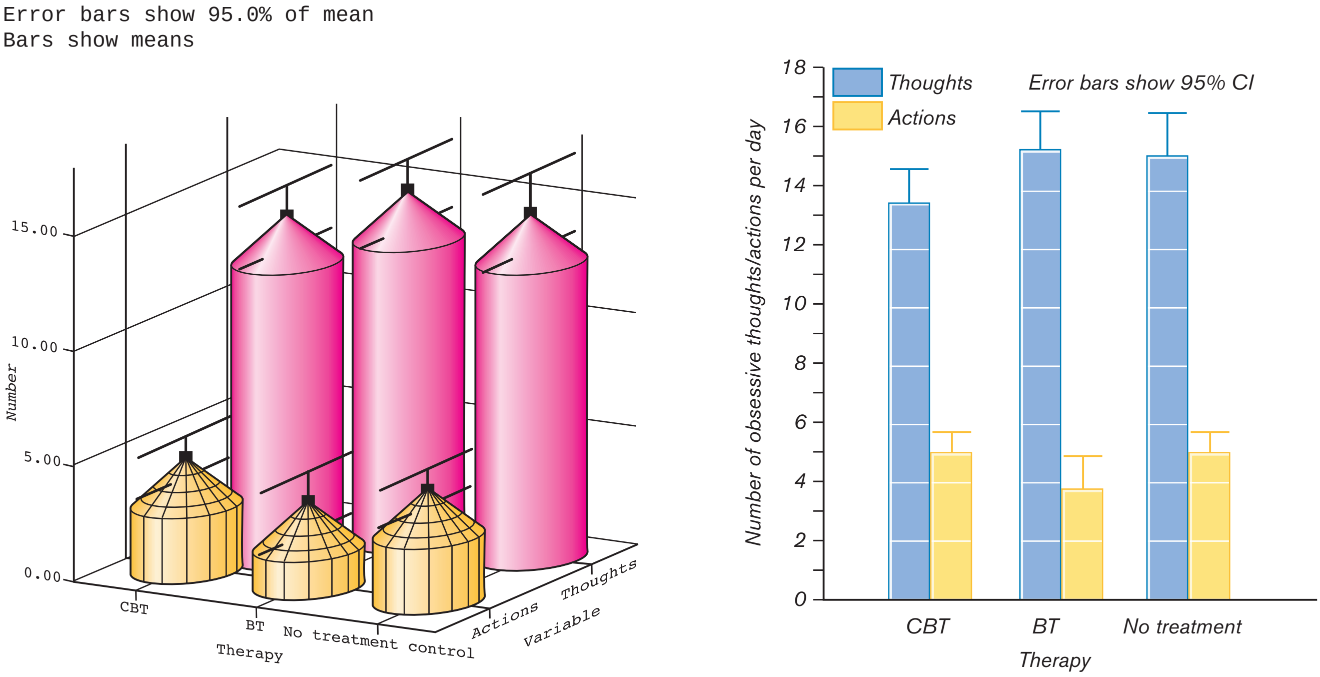


Figure 38.11

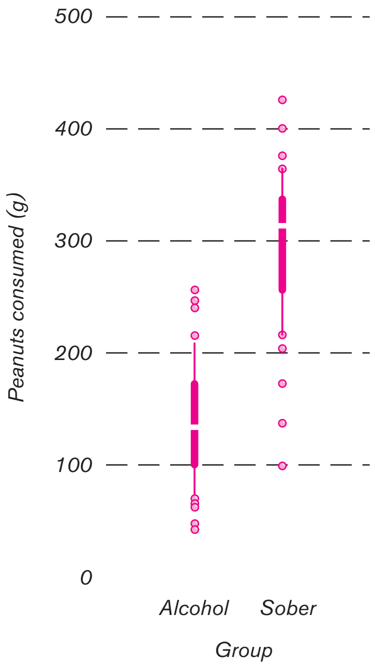


Figure 38.12 A 'minimal' boxplot

38.9. The median is shown by a white line, the interquartile range is shown by a thickened line rather than a box, and the ends of the whiskers have been deleted. This chart shows exactly the same information as the original boxplot, but with less ink, and less distractions. Distractions such as patterns on bars, or excessive 3-D or shading are known as chartjunk, that is, stuff that doesn't add anything to the display of data. One innovation of Tufte's that I particularly like is to eliminate grid lines on charts and instead put grid lines only on the bars of the chart (you'll notice I've done this on nearly every chart in this chapter). This really does facilitate a quick interpretation of the data.

Lies, damned lies and statistics

Governments love to lie with statistics, but scientists shouldn't. How you present your data can make a huge difference to the message conveyed to the audience (and politicians know this!). Figure 38.13 shows two graphs that, believe it or not, display exactly the same data. The first panel shows how the graph should probably be scaled. The important thing is that the y-axis begins at 0, and this creates the correct impression: that there isn't any difference between the amount that men and women urinate on the toilet seat. However, imagine you wanted to create the impression that men urinated on the toilet seat more than women (OK, so we know they do, but bear with me), all we have to do is re-scale the graph (by *not* starting the y-axis at zero) and there suddenly seems to be a huge difference. In fact, the difference is numerically very small, but the graph makes it look really big! Tempting as it is, don't do this!

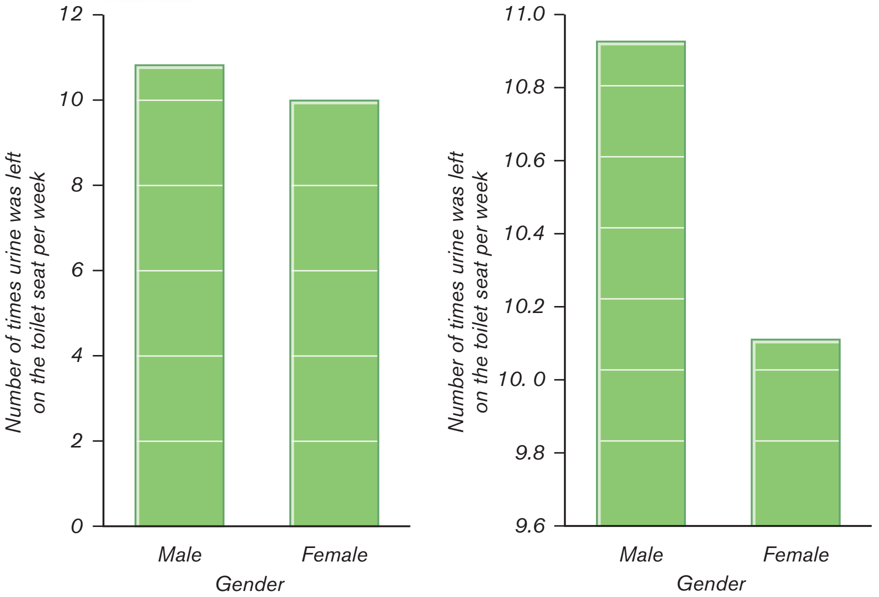


Figure 38.13 Lies, damned lies and statistics!

Final tips

So, if you want to draw a graph follow a few of Tufte's recommendations.

- Don't create false impressions of what the data actually show. (Likewise, don't hide effects!)
- Abolish chartjunk: don't use patterns, 3-D effects, shadows, pictures of hippopotami, photos of your grandma or anything else.
- Avoid excess ink: this is a bit radical, but if you don't need the axes, then get rid of them!

CLASS ACTIVITY BOX 38.4

Draw some graphs

Use some of the data sets in the activity boxes in this chapter to draw each of the following graphs:

- a boxplot
- bar charts
- line charts.

Try to remember Tufte's rules when you draw them!

Learning outcomes

When you have completed this chapter, you should be able to:

1. Plot a frequency distribution.
2. Describe what a normal distribution is and what properties it has.
3. Calculate a mode, mean, median, the range, the interquartile range, and standard deviation of a data set and describe what these statistics tell us about the data.
4. Present summaries of your data.

Further reading

Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.
Miles, J. M. V. and Banyard, P. (2007) *Using Statistics in Psychology Research*. London: Sage.
Rowntree, D. (1981) *Statistics Without Tears: A Primer for Non-mathematicians*. London: Penguin.
Wright, D. B. and London, K. (2009) *First Steps in Statistics*, 2nd edn. London: Sage. This book is a very gentle introduction to statistical theory.

If you want to learn about doing statistics using a computer, then the package called SPSS is very useful. I recommend:
Field, A. P. (2009) *Discovering Statistics Using SPSS: And Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage.

For graphing and displaying data I strongly recommend:
Tufte, E. R. (2001) *The Visual Display of Quantitative Information*, 2nd edn. Cheshire, CT: Graphics Press.
Although some of the graphs I've produced for this chapter would undoubtedly cause him to have an embolism, this book is worth reading because you should do as he does, not as I do!

Web links

http://www.easymaths.com is a good site for revising basic maths.

http://www.math.sfu.ca/~cschwarz/Stat-301/Handouts/node8.html has some good examples of bad graphs!

http://www.siggraph.org/publications/newsletter/v33n3/contributions/davis.html

Essay titles and references

1 Define the mean, mode and median. What are the advantages and disadvantages of each?

Field, A. P. (2009) *Discovering Statistics Using SPSS: and Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage
Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.
Miles, J. M. V. and Banyard, P. (2007) *Using Statistics in Psychology Research*. London: Sage.
Rowntree, D. (1981) *Statistics Without Tears: A Primer for Non-mathematicians*. London: Penguin.
Wright, D. B. and London, K. (2009) *First Steps in Statistics*, 2nd edn. London: Sage.

2 What is the difference between the sum of squared errors, the variance and the standard deviation? Why do we need all three measures?

Field, A. P. (2009) *Discovering Statistics Using SPSS: And Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage
Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.
Miles, J. M. V. and Banyard, P. (2007) *Using Statistics in Psychology Research*. London: Sage.
Rowntree, D. (1981) *Statistics Without Tears: A Primer for Non-mathematicians*. London: Penguin.
Wright, D. B. and London, K. (2009) *First Steps in Statistics*, 2nd edn. London: Sage.

3 Describe what Tufte (2001) considers as good and bad practice when preparing graphs. In each case explain why it is good or bad practice.

Tufte, E. R. (2001) *The Visual Display of Quantitative Information*, 2nd edn. Cheshire, CT: Graphics Press.

Research methods and statistics

39

Going beyond your sample

Route map

This chapter brings together everything you've learnt so far to try to explain how we use statistics to test hypotheses. The first step is to see whether summaries of our data (like the mean) are representative of our population and we can do this using the standard error and confidence intervals. We then look at the rationale behind fitting statistical models to test hypotheses. You will discover that the experimental and null hypothesis can be conceptualised in terms of a statistical model that is fitted to our data. The exact model depends on what data you have and what your hypotheses are, but in general terms every model throws out a statistic with known properties. Based on these properties, we can work out whether a value as large as the one we have would be likely if the null hypothesis is true. The final part of the chapter is spent giving you a brief overview of a range of statistical models and giving examples of when they should be used.

How accurate is my statistic?

Over the last two chapters we have discovered that psychologists use samples as a way of trying to understand what goes on in much larger populations. We have also seen that we can summarise these samples using statistical models such as the mean. Finally, we saw that we can use measures such as the standard deviation to tell us whether our model is a good fit of our data. Measures like the standard deviation tell us whether our mean is a good fit of the *sample*, but perhaps a more important question is whether our mean (or whatever model we are fitting to the data) is a good fit of the population.

The standard error

In Table 38.1 we looked at calculating the mean number of bands that a person watched at the Download festival. Imagine our population of interest is all the people at the festival (this seems like a reasonable population) and that we actually did ask all of them how many bands they saw. We might find that on average people watched 11 bands. This is known as the effect in the population. As we have seen, we don't normally have access to this effect, so instead we take samples (see Figure 39.1). Notice that many of these samples have different means to the population mean. These differences are known as sampling error; that is, values in a sample will differ slightly from the value in the population. Some samples might be very representative of the population (as you can see in the diagram, some have no sampling error and have the same mean as the population), but others will be less representative and will have a mean different to the population (they have sampling error). The differences between statistics computed in different samples is called sampling variation, that is, samples will vary because they contain different members of the population. Interestingly, if we were to plot a frequency distribution of the sample means we would find that we get a nice symmetrical distribution known as a sampling distribution. Just like frequency distributions tell us something about the behaviour of individuals within a sample, a sampling distribution tells us about the behaviour of samples within a population. One important fact is that the sampling distribution will be centred at the same value as the mean of the population (11 in this case). Put another way, if we took the average of all the means of all possible samples from a population we would get the value of the population mean. Therefore, if we could work out the accuracy of this average then we would know something about how likely it is that a given sample is representative of the population.

When we wanted to know how well the mean fitted the sample data we used the standard deviation: small standard deviations meant that most data points were close to the mean, a large standard deviation meant that data points were widely spread from the mean. Therefore, if we could calculate the standard deviation between sample means then this would give us a measure of how much variability there was between different samples from the same population. In fact, we can estimate the standard deviation of sample means (without having to actually collect lots of samples) and it's called the standard error of the mean (SE).

CLASS ACTIVITY BOX 39.1

Sampling variation

Think of a variable that you can easily and quickly measure among your classmates and that's interesting to you all (examples could be number of boyfriends/girlfriends you've had, units of alcohol you drink per week, weight, height). OK, now each person write down their score for this variable.

Using the scores of all of the class, calculate the average. This is your *population* value.

OK, now split up into small groups of about five or six people. Each group is now a *sample* from the *population* that is your class. Each group/sample should now calculate the mean score within their group. When everyone has done this, write the score on a big piece of paper and hold it up for everyone else to see.

Is the average score for your group, the same as the score for the whole group that you originally calculated? If not, this illustrates *sampling error*. Which group has the largest sampling error (i.e. the biggest difference from the mean of the whole class)? Which group has the least sampling error? The group with the least is the one that most closely represents your class as a whole.

Now, look around at the mean values being held up by each group in the room. Are they the same? They probably will be different and this shows you *sampling variation*; that is, values calculated for different samples will be quite different.

I hope that this simple class activity illustrates some of the key concepts in statistics. That is, unlike your class, we don't usually have access to the entire population so we take samples. However, samples will differ, and some samples are more representative of the population than others. That's why it's important to try to estimate how representative a sample is of the population from which it came.

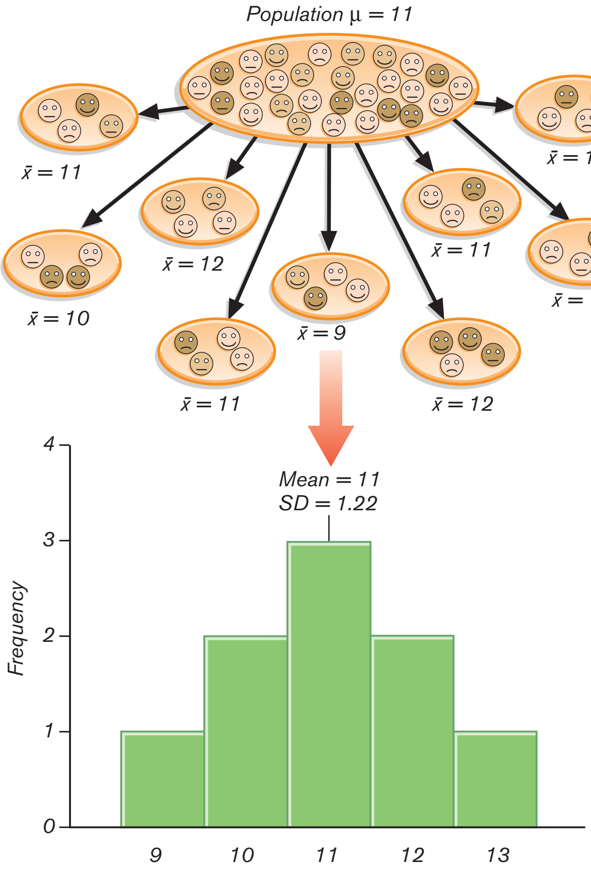


Figure 39.1 Samples taken from a population will have different means

We estimate the standard error by dividing the standard deviation in the sample by the square root of the sample size. The resulting value is interpreted in much the same way as the standard deviation: small values tell us that sample means are, in general, quite similar and so the sample mean is representative of the mean in the population, and large values tell us that samples can be very different and so the sample mean might not be representative of the population.

Confidence intervals

A different approach to assess how well a sample statistic represents the population is to calculate boundaries within which we think the population mean falls. The best way to think of this is to imagine that we, going back to our Download example, collected data from 100 samples. For each sample, the mean might be similar or different from the mean in the population (remember measurement error). So rather than use the mean itself (a point estimate) we could construct an interval around the mean within which we were fairly confident the population would fall. So, say the mean in the sample was 10 bands seen, we could set our interval to be from 6 to 14 (note that the mean is the mid point of these two values). We might set these values believing that it's very likely that the value in the population falls between these values (so, it might not be exactly 10, but we think it will lie somewhere between 6 and 14). Remember I said we'd collected 100 samples? The reason I said that is to explain how confidence intervals work. So far we have 100 samples, and for each sample we have calculated an interval that on each occasion we think the population mean will fall within. For samples this assumption might be true, but for others it might be wrong – perhaps the interval we set was too narrow and we missed the population value. Confidence intervals are intervals around the mean value in a sample that are constructed in such a way that we know how likely it is that they will contain the population mean. Psychologists usually deal with 95% confidence intervals (another throwback to Fisher's 5% criterion that we found out about in Chapter 38) and in our example this would mean that of the intervals that we constructed for our 100 samples, 95 of those intervals would contain the population mean, but 5 of them would miss it. A 95% confidence interval is, therefore, an interval designed to contain the true value of the mean (the value in the population) 95 times out of 100. For a given sample then, the confidence interval has a 95% chance of containing the population mean, but it could also be one of the 5 samples out of 100 for which the interval misses the true value.

Self-test: What is a confidence interval?

Probability and hypotheses

In Chapters 36 and 37 we came across the idea that to test theories we had to generate hypotheses from these data and then collect data to see whether the data support our hypothesis. I also mentioned in Chapter 36 that when we use numbers to test theories we do so by fitting statistical models to our data and then seeing whether or not they fit the data well. These models can be simple, such as saying that the mean in one group will be different to the mean in another group, or complex, such as saying that 20 variables are related to each other.

Test statistics

Regardless of the complexity of the model we use, the underlying principles when we use statistical methods are more or less the same. We saw in Chapter 37 that there are two types of variation: systematic and unsystematic. The systematic variation is due to some genuine effect (be that the effect of an experimenter doing something to all of the participants in one sample but not in other samples, or natural variation between sets of variables). You can think of this as variation that can be explained by the model that we have fitted to the data because we know from where it comes. Unsystematic variation, however, is variation that isn't due to the effect in which we are interested and can come from a variety of unknown sources. Therefore, this variation is the error in the model, or the variation that the model can't explain.

So, we have a hypothesis, we fit some kind of statistical representation of that hypothesis to our data and then test whether that statistical model is a good representation of what's going on. To test whether the model is a good fit we use a test statistic. A test statistic is simply a statistic that has known properties; specifically we know how frequently different values of this statistic occur. By knowing this, we can assess the likelihood of obtaining particular values of that statistic.

Field and Hole (2003) suggest that you think of a test statistic as being a bit like the age at which people die. Past data have told us the distribution of the age of death. For example, we know that on average men die at about 75 years old, and that this distribution is top-heavy; that is, most people die above the age of about 50 and it's fairly unusual to die in your teens (you will be relieved to know!). So, the frequencies of the age of death at older ages are very high but are lower at younger ages. Having a detailed knowledge of the distribution of the age of death, if we met a man of 98, we could calculate the probability of him having lived that long (it would be a small probability because most people die before they reach that age). Test statistics are the same: we know their distributions in detail, so once we have calculated a test statistic, we can discover the probability of having found a value as big as we have.

The computation of these test statistics is way beyond the scope of this chapter (and Field, 2009, covers most of the ones you're likely to come across), but essentially most of them are some function of the systematic variance divided by the unsystematic variance. Put another way, they are all related, in some way, to how much variance the model can explain (and usually as a function of how much variation there was in total, or how much variation the model can't explain).

Statistical significance

In Chapter 36 we discovered that there are two types of hypothesis: a null hypothesis and an alternative hypothesis. Theories are tested by generating these hypotheses and then seeing which of the two hypotheses are supported by the data. If we reduced our two types of hypothesis down into very general terms we could express the alternative hypothesis as 'there is an effect' and the null hypothesis to 'there is not an effect'. The statistical model we fit to our data will crudely reflect this. As such, whatever statistical model we apply to our data, our alternative hypothesis is 'there is an effect' (be that effect a difference between two or more groups, or a relationship between variables), and the null hypothesis is 'there is no effect' (be that no difference between groups, or no relationship between variables).

The test statistic we calculate for a particular model reflects whether the model is a good fit of the data. Given that the model we fit necessarily reflects the alternative hypothesis this means that the test statistic gives us an idea of whether the alternative hypothesis is true. The better the fit of the model to the data, the bigger the test statistic will be, and the more unlikely it is to occur by chance (like our 98-year-old man). Therefore, for most test statistics, a big value is desirable. As test statistics get bigger, the probability of them occurring (called the p-value) becomes smaller. When this p-value falls below 0.05 (Fisher's criterion), we accept this as giving us enough confidence to assume that the test statistic is as large as it is because of our model is a sufficiently good fit of the data. Put another way, we become confident that our experimental hypothesis is likely to be true. In fact, we can go a bit further than this and infer that the experimental hypothesis is likely to be true not just in our sample but in our population too. We say that our effect is statistically significant.

If our test statistic is statistically significant you will often hear people say that it means we can 'reject the null hypothesis' and 'accept the alternative hypothesis'. If the test statistic is small, and not significant, you often hear of people 'accepting the null hypotheses as true'. These are all misconceptions of what the test statistic actually means. It may shock you to discover that the null hypotheses is *never* true: there is always some effect, it's just whether that effect is big enough for us to consider it important (see Cohen, 1990; 1994). As such you should never say that you rejected the null hypothesis. So, a non-significant test statistic only really means that the effect was very small.

A significant test statistic tells us that *if* the null hypothesis were true then it is unlikely that we would get a test statistic as large as the one we have got. People usually take this as evidence that the alternative hypothesis is true. However, we have just said that the null hypothesis is never true, so the whole reasoning behind this kind of hypothesis testing is fallacious! It's also worth remembering that the criterion of 0.05 is completely arbitrary: it is not magical and it could just have easily have been 0.127, 0.92, or 0.01 depending on Fisher's sanity at the time!

One- and two-tailed tests

We saw in Chapter 36 that hypotheses could be one-tailed or two-tailed. Given that statistical models reflect our hypothesis, it should not surprise you that this distinction applies to our statistical models too: we can test them either one- or two-tailed. Imagine we wanted to discover whether psychopathic murderers eat more or less meat than normal people. We could either do this quasi-experimentally by taking two groups (one of psychopathic murderers and one of normal people) or correlationally (by measuring psychopathic tendencies and meat consumption). If we have no directional hypothesis then there are three possibilities:

1. Psychopaths eat more meat than normals: the mean for psychopath minus the mean for normals is positive, or correlationally speaking the more psychopathic you are the more meat you eat—a positive relationship.
2. Psychopaths eat less meat than normals: the mean for psychopath minus the mean for normals is negative, or correlationally speaking the more psychopathic you are the less meat you eat—a negative relationship.
3. There is no difference in meat consumption between psychopaths and normals: the mean for psychopaths minus the mean for normals is exactly zero, or correlationally, there is no relationship between psychopathy and meat consumption. This is the null hypothesis.

The direction of the test statistic (i.e. whether it is positive or negative) will depend on whether the difference, or relationship, is positive or negative. Assuming the test statistic is positive (psychopaths eat more meat), then to assess whether or not this test statistic is likely to have occurred we have to look at the positive end of the distribution (see Figure 39.2). Therefore, if we have predicted incorrectly and actually psychopaths eat less meat, then we would miss this effect (because we would be looking at the wrong end of the distribution!). To overcome this, we can hedge our bets and make a two-tailed hypothesis. In doing so we look at both ends (or tails) of the distribution of possible test statistics. Doing this has a price because to keep our criterion probability of 0.05 we have to split this probability across the two tails: so we have 0.025 at the positive end of the distribution and 0.025 at the negative end (see Figure 39.2). In Figure 39.2 you will note that if we make a specific prediction then we need a smaller test statistic to find a significant result (because we are looking in only one tail).

Errors

We have seen that we use test statistics to tell us whether there is an effect in our population. If we take a conventional view of hypothesis testing then there are two possibilities in the real world: there is, in reality, an effect in the population, or there is, in reality, no effect in the population. We use samples to decide which of these possibilities is more likely, however, even though we are fairly conservative about deciding that an effect exists (we have to be 95% confident) there is still a margin of error. In fact there are two mistakes we can make. A Type I error occurs when we infer that there is a genuine effect in our population, when in fact there isn't. If we use Fisher's criterion then the probability of this error is 0.05 (or 5%) when there is no effect in the population—this value is known as the α-level. Assuming there is no effect in our population, if we replicated our data collection 100 times we could expect that on five occasions we would obtain a test statistic large enough to make us think that there was a genuine effect in the population even though there isn't.

The opposite is a Type II error, which occurs when we believe that there is no effect in the population when, in reality, there is. In an ideal world, we want the probability

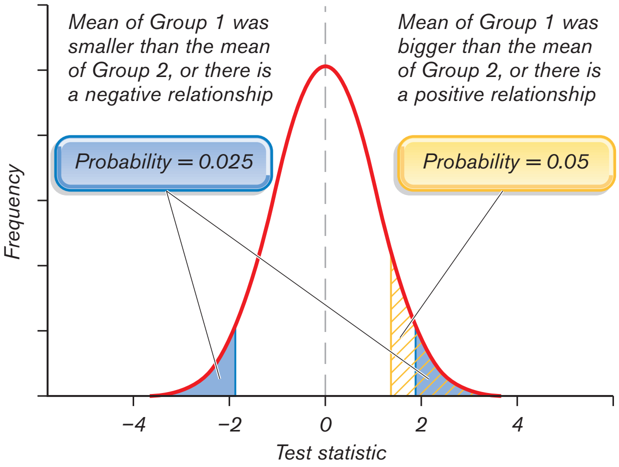


Figure 39.2 One- and two-tailed tests

of this error to be very small (if there is an effect in the population then it's important that we can detect it). Cohen (1992) suggests that the maximum acceptable probability of a Type II error would be 0.2 (or 20%)—this is called the β-level. That would mean that if we took 100 samples of data from a population in which an effect exists, we would fail to detect that effect in 20 of those samples (so we would miss 1 in 5 genuine effects).

There is obviously a trade off between these two errors: if we lower the probability of accepting an effect as genuine (i.e. make α smaller) then we increase the probability that we'll reject an effect that does genuinely exist (because we have been so strict about the level at which we'll accept that an effect is genuine).

Self-test: What is the difference between a one- and two-tailed test? What is the difference between a Type I and Type II Error?

How important is my effect?

Effect sizes

We have just described the traditional way that psychologists conceive of hypothesis testing using test statistics. However, we have already alluded to the fact that the logic behind this approach is flawed. One of the problems that I mentioned was that the null hypothesis is never true: there is always an effect of some description even if it is very small. We have also hinted that the criterion of having a *p*-value less than 0.05 is completely arbitrary. One way to get around these problems is to become less concerned with 'significance' and more concerned with quantifying the size of effect.

When we measure the size of an effect (be that an experimental manipulation or the strength of relationship between variables) it is known as an effect size. An effect size is simply an objective and (usually) standardised measure of the magnitude of observed effect. The fact that the measure is standardised just means that we can compare effect sizes across different studies that have measured different variables, or have used different scales of measurement (so an effect size based on speed in milliseconds could be compared to an effect size based on heart rates). Many measures of effect size have been proposed, the most common of which are Cohen's *d*, and Pearson's correlation coefficient, *r* (see Field, 2001, 2005). Pearson's correlation coefficient, *r*, may be preferable as an effect size measure because it is constrained to lie between 0 (no effect) and 1 (a perfect effect).

Effect sizes are useful because they provide an objective measure of the importance of an effect. So, it doesn't matter what effect you're looking for, what variables have been measured, or how those variables have been measured we know that a correlation coefficient of 0 means there is no effect, and a value of 1 means that there is a perfect effect. Cohen (1992, 1988) has also made some widely used suggestions about what constitutes a large or small effect:

- $r = 0.10$ (small effect): in this case the effect explains 1% of the total variance.
- $r = 0.30$ (medium effect): the effect accounts for 9% of the total variance.
- $r = 0.50$ (large effect): the effect accounts for 25% of the variance.

We can use these guidelines to assess the importance of our effects (regardless of the significance of the test statistic). Just like with means, we are actually interested in the size of the effect in the population, but because we don't have access to this value we use the effect size in the sample to estimate the likely effect size in the population (Field, 2001).

Statistical power

The effect size in a population is linked to the sample size on which the sample effect size is based, the probability level at which we will accept an effect as being statistically significant; and the ability of a test to detect an effect of that size (known as the statistical power). As such, once we know three of these four properties (effect size, sample size, significance level and the statistical power), then we can always calculate the remaining one. The power of a test is the probability that a given test will find an effect assuming that one exists in the population. Now, there are two useful things we can do knowing that these four variables are related:

1. *Calculate the power of a test*: Given that we have conducted our experiment, we will have already selected a value of α (it will be 0.05), we can estimate the effect size based on our sample, and we will know how many participants we used. If we did not get a significant result then this could be because we didn't have enough power to detect it. We can use these values to calculate the power of our test. If this value turns out to be 0.8 or more we can be confident that the lack of significance was not because we didn't have enough power to detect the effect.
2. *Calculate the sample size necessary to achieve a given level of power*: we can set the value of α (0.05) and the level of power (0.8), and we can use past research to estimate the size of effect that we would hope to detect in an experiment. Knowing these three things we can calculate how many participants we would need to detect that effect. Deciding how many participants you need is an important aspect of research design and this gives you a good statistical basis on which to base this decision.

Self-test: What are effect sizes and statistical power?

Assumptions of parametric tests

Statistical models usually have assumptions of some description. These are conditions under which the test statistics are known to be accurate. Many of the tests described in this chapter are parametric tests based on the normal distribution. A parametric test is one that requires data from one of the large catalogue of distributions that statisticians have described and for data to be parametric certain assumptions must be true. If you use a parametric test when your data are not parametric then the results are likely to be inaccurate. The assumptions of parametric tests based on the normal distribution are as follows.

1. **Normally distributed data**: it is assumed that the data are from one or more normally distributed populations.
2. **Homogeneity of variance**: this assumption means that the variances should be the same throughout the data. In designs in which you test several groups of participants this assumption means that each of these samples come from populations with the same variance. In correlational designs, this assumption means that the variance of one variable should be stable at all levels of the other variable.
3. **Interval data**: data should be measured at least at the interval level.
4. **Independence**: the behaviour of one participant should not influence the behaviour of another. In repeated measures designs, we expect scores in the experimental conditions to be non-independent for a given participant. For example, if we tested a person's memory when sober and after 20 pints of vodka, we'd expect these scores to be related in some way because the person we've tested has a natural ability to remember things that he brings to both experimental tasks. However, behaviour between different participants should still be independent, so, if we tested another person's memory when sober and after vodka, her scores should be unrelated to the previous person's: her natural ability to remember things should not have any effect on the other person's ability to remember things.

The assumptions of interval data and independent measurements are, unfortunately, tested only by common sense. The assumption of homogeneity of variance is tested statistically (see Field, 2009) and the assumption of normality can be checked crudely by looking at whether the distribution of scores in the sample is normal (again, see Field, 2009 for more detail).

Self-test: What are the assumptions of parametric tests based on the normal distribution?

Statistical models of relationships between variables

The remainder of this chapter looks at different statistical models (tests) and the situations in which they are used.

Correlation

It is often interesting for researchers to know what relationship exists, if any, between two or more variables. A correlation is a measure of the linear relationship between variables. For example, I might be interested in whether there is a relationship between how old you are and how much you like the music of Satan-loving Swedish black metallers Dimmu Borgir. These two variables could be related in several ways (Figure 39.3).

- They could be positively related, which would mean that the older you were the more you enjoy listening to Dimmu Borgir;
- They could be negatively related, which would mean that the older you get the less you enjoy listening to Dimmu Borgir;
- They could be not related at all, which would mean that as age changes the enjoyment of Dimmu Borgir stays the same.

An important thing to remember about correlations is that they tell us nothing about causality (this point should have been sufficiently drummed home by now!). So, if we found a negative relationship between age and listening to Dimmu Borgir, even though it might be tempting to interpret this as age causing you to like Dimmu Borgir less, statistically speaking there's no reason why it's not true that listening to Dimmu Borgir makes you young!

Pearson's r

Pearson's correlation coefficient, r (Pearson's $\boldsymbol{r}$), is a parametric measure of the relationship between two variables invented by Karl Pearson (remember, Fisher's nemesis). It can have a value between –1 and 1, where –1 is a perfect negative relationship (as one variable increases, the other variable decreases by exactly the same amount), and +1 is a perfect positive relationship (as one variable increases, the other variable also increases by exactly the same amount). A value of 0 means that the variables are completely unrelated. As we saw above, values of 0.1 (or –0.1) represent a small effect, values of 0.3 (or –0.3) represent a medium effect size and values of 0.5 (or –0.5) represent a large effect.

The other useful thing about r is that if we square it then the resulting value, the coefficient of determination, R^2, tells us the proportion of variance that is shared by the variables. So, if r is 0.28, then $R^2 = 0.078$, if we multiply this by 100 it tells us this proportion as a percentage. In this case the two variables would share 7.8 of their variance.

However, Pearson's correlation coefficient is dependent on the assumptions of parametric tests. If one of these

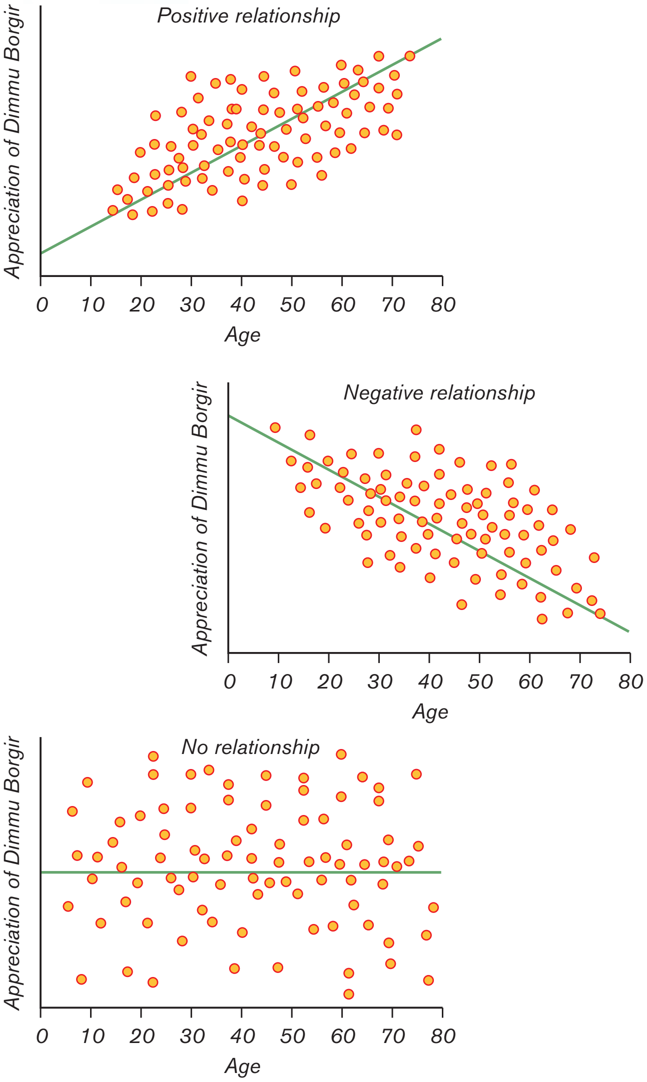


Figure 39.3 An example of a correlation

assumptions is not met then we have to use an alternative method (Spearman's ρ).

Spearman's ρ

Charles Spearman came up with an alternative method for producing a measure of the relationship between variables, which is not dependent on the assumptions of parametric tests. In short, it is the same as Pearson's correlation except that it is calculated on the ranks of data rather that the data itself. Ranked data are just when you take all of the scores, list them in ascending order, and then starting with the lowest score you assign it a rank of 1, then the next highest score a rank of 2 and so on. Like, Pearson's correlation, Spearman's test statistic lies between –1 and +1 and can be interpreted in the same way (except we can't square it to find out how much variance the variables share because we analysed the ranks not the raw data).

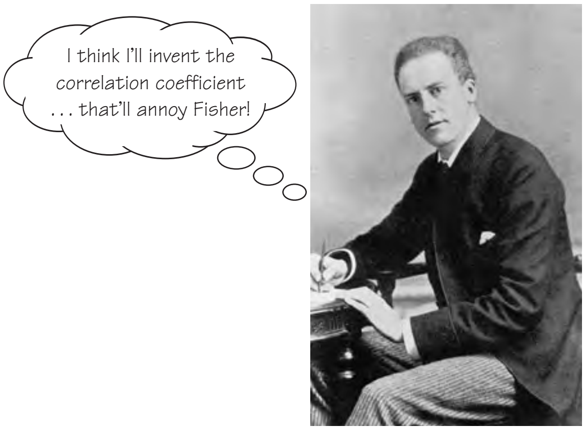


Photo 39.1 Pearson invents the correlation coefficient.

Partial and semi-partial correlation

Sometimes when we want to quantify the relationship between two variables, we want to control for the effect of some other variable. We can do this using something called a partial correlation or a semi-partial correlation. The difference between these two test statistics is quite subtle. Both of these correlations look at the relationship between two variables controlling for the effect that a third variable has. However, when we do a partial correlation the effect that the third variable has on *both* variables in the correlation is controlled. In a semi-partial correlation we control for the effect that the third variable has on only one of the variables in the correlation.

For example, we might want to explore the relationship between age and listening to Dimmu Borgir controlling for whether you worship Satan. Worshipping Satan is likely to relate to listening to Dimmu Borgir (because they themselves are Beelzebub-loving folk!). It would also be likely to relate to age if by worshiping Satan he rewarded you with eternal youth. Figure 39.4 shows the difference between a partial and semi-partial correlation. The partial correlation looks at the relationship between age and listening to Dimmu Borgir, but controls for the effect that devil worship has on both age and listening to Dimmu Borgir. The semi-partial correlation also looks at the relationship between age and listening to Dimmu Borgir, but controls only for the effect that devil worship has on listening to Dimmu Borgir.

Regression

Regression takes the correlation a step further by fitting a predictive model to the data. In the simple two variable situations this model is just:

$$\text{Outcome}_i = b_0 + b_1 \text{ Predictor}_i + \varepsilon_i$$

The bs in the equation are constants: b_0 is the value of the outcome variable when the predictor is 0, and b_1 tells how important a particular predictor is for predicting the outcome. ε is an error term. Put simply this model just means that the outcome variable can be predicted from the predictor variable multiplied by its importance in predicting the outcome, plus the value of the outcome when the predictor is 0, plus a bit of error.

One common misconception is that because we are predicting the outcome this somehow magically tells us that the predictor causes the outcome. It doesn't. Remember, the researcher decides which variable is which in the model. So, if we wanted to predict appreciation of Dimmu Borgir from age the model would be:

$$\text{Dimmu Borgir}_i = b_0 + b_1\,\text{Age}_i + \varepsilon_i$$

However, we could calculate the model the opposite way around:

$$\text{Age}_i = b_0 + b_1\,\text{Dimmu Borgir}_i + \varepsilon_i$$

So, as you can see, it's not a causal model, it just tells you how to predict one variable from another.

Interestingly, we can easily extend the regression model to include more than one predictor. If we had a second predictor it simply becomes:

$$\text{Outcome}_i = b_0 + b_1\,\text{Predictor1}_i + b_2\,\text{Predictor 2}_i + \varepsilon_i$$

b_0 is the value of the outcome variable when all predictors are 0, b_1 tells us how important the first predictor is for predicting the outcome, and b_2 tells us how important the second predictor is for predicting the outcome. ε is again an error term. We can keep extending the model by adding predictors, and each predictor we add will have an associated b value that tells us the relative importance of that predictor for predicting the outcome. So, in our Dimmu Borgir example, we might add in devil worship as a second predictor:

$$\text{Dimmu Borgir}_i = b_0 + b_1\,\text{Age}_i + b_2\,\text{Devil Worship}_i + \varepsilon_i$$

In regression analysis we first test whether the model is a significant fit of the data (i.e. do the predictors generally do a good job of predicting the outcome) using a test statistic called F. We then test the predictors individually to see whether they significantly contribute to predicting the outcome. We do this using a t-statistic.

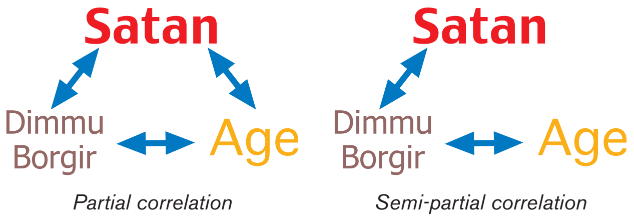


Figure 39.4 Partial and semi-partial correlations

Multiple regression is often used in cross-sectional research, where lots of questionnaires are administered at one point in time and then multiple regression is used to look at which variables can be used to predict an outcome. For example, we might predict condom use from age, gender, previous use, social norms and beliefs about condom use (see Abraham et al., 1999).

Statistical models of differences

We have seen in previous chapters that often researchers use groups of people or different experimental conditions to try to discover causal relationships between variables. Therefore, we need statistical models that look at situations where we want to compare different conditions of groups of people. This section looks at these models.

One predictor with two levels

Independent T-test

The simplest situation is where there is just one predictor (one variable that has been manipulated) and we have manipulated this variable in just two ways (a treatment group and a control). This is the situation represented by the post-test only control group design (Figure 37.2). When we use different people in the two conditions, we have an independent design, and we analyse this situation with an independent t-test.

There's been fuss in the news recently about toxoplasmosis, which is a disease caught by humans from cats (pregnant women have to be particularly careful). Although lots of humans are infected with this virus and remain unaware of the fact they are, recent reports suggest that it increases aggression in males. If we wanted to test this we could get a group of infected males and group of uninfected males and then simply test their aggression by perhaps giving them a very frustrating task and seeing how many times they hit a punch bag. These groups would have to contain *different* males because you can't be infected and uninfected at the same time! (see Figure 39.5)

The t-test is a statistic that comes from the t-distribution, which is a family of distributions. To know which family a particular t comes from we need to know the degrees of freedom (df). This is just the total number of people tested minus 2 (so, if we had 10 infected men, and 10 uninfected men we would have $df = 10 + 10 - 2 = 18$).

When we know which distribution the statistic comes from we can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. We can look at the mean of the two groups to tell us the nature of the effect (in this case we would expect the mean aggression to be higher in the infected men than the uninfected men).

Finally, the *t*-test is parametric and so is accurate only when the assumptions of parametric tests have been met.

Mann-Whitney

If the assumptions have not been met then we have to use a test that does not rely on these assumptions. The Mann-Whitney test is used in the same situations as the independent *t*-test but when the assumptions of parametric tests have been broken. Like Spearman's correlation it gets around the assumptions of parametric tests by analysing the data after it has been ranked (rather than the raw scores).

The fuss about toxoplasmosis also extends to women. Apparently, rather than getting more aggressive, infected females become more amorous: their libido goes up! If we wanted to test this we could get a group of infected females and group of uninfected females and then simply test their libido in some way that we can leave to your imagination (see Figure 39.6). We might find, however, that levels of libido were not normally distributed.

The Mann-Whitney test produces a test statistic *U*, which like the t-test has known properties, so we can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. We should look at the median of the two groups to tell us the nature of the effect (in this case we would expect the mean libido to be higher in the infected women than the uninfected ones).

Related t-test

Sometimes we might want to look at differences between two experimental conditions when we have used the same people in each condition (a repeated measures design). This is the situation represented by the post-test only repeated measures control group design (Figure 37.6). When we use the people in the two conditions, we have a repeated measures design, and we analyse this situation with a related t-test.

Students often leave things until the last minute. So, they'll have an essay deadline that is 3 months away, and yet write the essay in the 12 hours before the deadline. This surely can't be good for your grades, so we could test this by taking a group of students. For one of their essays we ask them to come in every week over the 3-month period to work on their essay at fixed times of the week. For a different essay, we lock them in a room for the 12 hours before the deadline (see Figure 39.7). Obviously it's important to control for the natural ability of the students so we could use the same students (although we should vary the order in which they complete the tasks, we ignore this in the analysis: we compare all the marks for essays that took '3 weeks' with all the marks for essays that took '12 hours').

The related *t*-test, like the independent *t*-test, comes from a family of *t*-distributions. To know which family a related *t* comes from we again need to know the degrees of freedom (*df*), but this time it is simply the number of people we have used minus 1 (so, if we had 20 students $df = 20 - 1 = 19$).

When we know which *t*-distribution the statistic comes from we can calculating the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. We can look at the mean of the two groups to tell us the nature of the effect (in this case we would expect the mean essay mark to be higher when the students had spent 3 weeks doing them).

Finally, the *t*-test is parametric and so is accurate only when the assumptions of parametric tests have been met.

Wilcoxon signed-rank test

If the assumptions of parametric tests have not been met then we have to use a test that does not rely on these assumptions. The Wilcoxon signed-rank test is used in the same situations as the related *t*-test but when the assumptions of parametric tests have been broken. Like the Mann-Whitney test it gets around the assumptions of

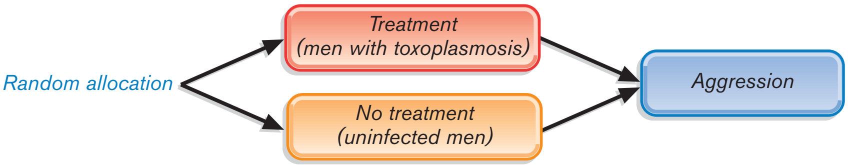

Random allocation
Treatment (men with toxoplasmosis)
No treatment (uninfected men)
Aggression

Figure 39.5 Example of a t-test

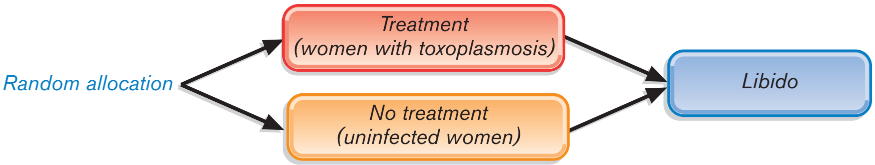

Random allocation
Treatment (women with toxoplasmosis)
No treatment (uninfected women)
Libido

Figure 39.6 Example of a Mann-Whitney test

parametric tests but analysing the data after it has been ranked.

Rather than looking at how long the students took to write their essays, we could look at the effect of how many deadlines they have. So, for one essay we could set them two other pieces of work due in on the same day (so 3 deadlines to meet) and for another essay we set them no other deadlines (so they can concentrate on the one essay). We might find that the essay marks were not normally distributed (see Figure 39.8).

The Wilcoxon test produces a test statistic *T*, for which we can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. We should look at the median of the two groups to tell us the nature of the effect (in this case we would expect the mean essay mark to be higher when there is only one deadline).

One predictor with several levels

One way independent ANOVA

The next most complex scenario is when we still have just one predictor (one variable that has been manipulated) but we have manipulated this variable in more than two ways (for example two treatment groups and a control). This is the situation represented by the post-test only control group design with several experimental conditions (see Figure 37.3). When we use different people in all of the conditions, we have an independent design, and we analyse this situation with an analysis of variance (ANOVA). Because there is only one predictor, and different participants have been used, it is called a one-way independent ANOVA.

Pets are supposed to be therapeutic: owning a pet extends your life (well, unless they give you toxoplasmosis). A researcher wanted to study whether different pets were more anxiety-reducing. They took three groups of people. One group were given cats to look after, one group were given dogs to look after, and a control group were not given a pet. We could then test how relaxed they were after a month (see Figure 39.9).

ANOVA produces a test-statistic, *F*. We can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. The ANOVA just tells us there is a difference: it doesn't tell us which groups differ from which. If the overall ANOVA is significant we should conduct post hoc tests. These are basically lots of *t*-tests that compare all of the different groups (so, dog vs cat, dog vs control, cat vs control).

ANOVA is parametric and so is accurate only when the assumptions of parametric tests have been met.

Kruskal-Wallis test

The Kruskal-Wallis test is used when you have one predictor that has several levels (three or more) and you've used different people in each group but the assumptions of parametric data have been violated. Like the Mann-Whitney and Wilcoxon tests it analyses the ranked data rather than the raw scores.

Imagine we did our pet study, but added a new group of people (bear in mind ANOVA and Kruskal-Wallis can be used with any number of groups). This new group were given lizards as a pet. The relaxation scores were not normally distributed so ANOVA could not be used (see Figure 39.10).

The Kruskal-Wallis test produces a test statistic *H*, and we can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. Like ANOVA, it doesn't tell us which groups differ from which. If the overall ANOVA is significant we should conduct post hoc tests. These would be lots of Mann-Whitney tests that compare all of the different groups (so, dog vs cat, dog vs control, cat vs control, dog vs lizard, cat vs lizard, lizard vs control).

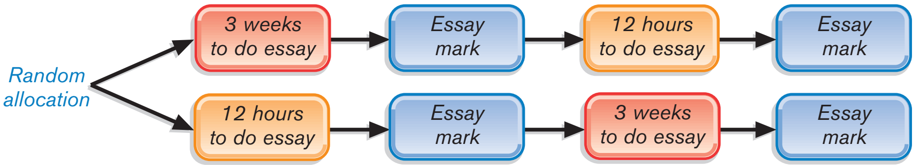


Figure 39.7 Example of a related t-test

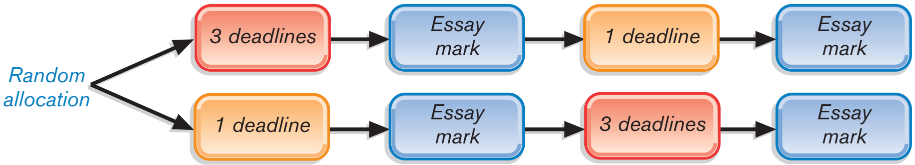


Figure 39.8 Example of a Wilcoxon signed-rank test

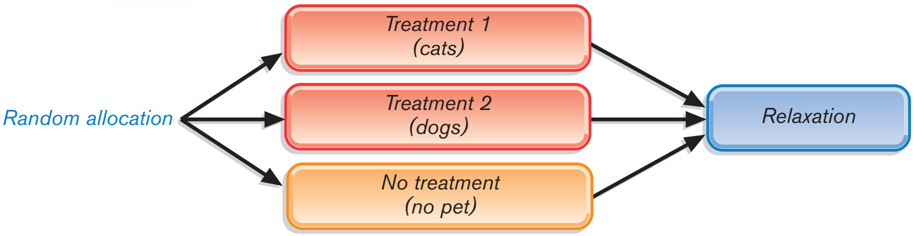

Random allocation
Treatment 1 (cats)
Treatment 2 (dogs)
No treatment (no pet)
Relaxation

Figure 39.9 Example of a one-way independent ANOVA

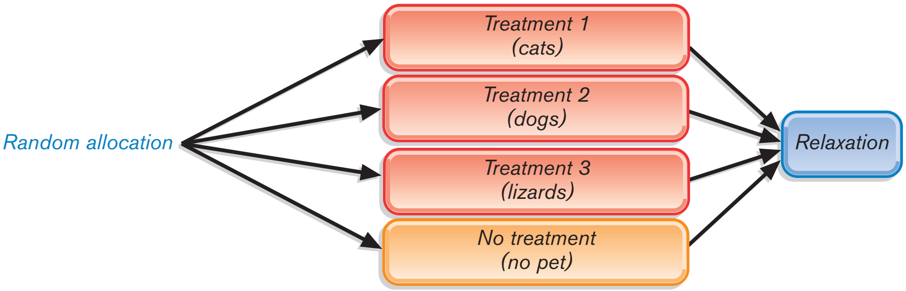

Random allocation
Treatment 1 (cats)
Treatment 2 (dogs)
Treatment 3 (lizards)
No treatment (no pet)
Relaxation

Figure 39.10 Example of a Kruskal–Wallis test

One-way related ANOVA

Sometimes we might want to look at differences between more than two experimental conditions when we have used the same people in each condition (a repeated measures design). When we use the same people in the two conditions, we have a repeated measures design, and we analyse this situation with a one-way related ANOVA.

MP3 music files can be encoded at different qualities: 128 kbps (CD quality), 96 kbps (near CD quality), 64 kbps (FM radio quality). The lower the quality the less room the file takes up on your computer. A company developing MP3 walkmans was interested in whether people could actually tell the difference between these qualities (because if they can't then they can encode the files at lower qualities and fit more on the walkmans. Therefore, they played a group of people a song (not Dimmu Borgir this time, you will be pleased to know) at each of the three qualities and then asked the people to rate how good the quality of the recording was. It's important to control for the natural hearing ability of the people so the same people were used (see Figure 39.11).

Each person hears the three MP3s and rates them, but people here them in different orders. The diagram shows a Latin square counterbalancing order. The important thing to note is that each experimental condition appears in every location (so, each type of MP3 is heard first by some people, second by others and last by the remainder). Again, for the purpose of analysis we ignore the counterbalancing and just analyse all the quality ratings for the 128 kbps MP3, the 96 kbps MP3 and the 64 kbps MP3.

Like independent ANOVA, related ANOVA produces a test-statistic, *F*. We can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. The ANOVA just tells us there is a difference: it

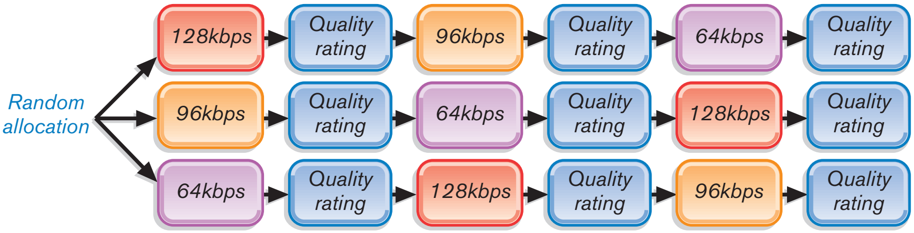

Random allocation
128kbps
Quality rating
96kbps
Quality rating
64kbps
Quality rating
96kbps
Quality rating
64kbps
Quality rating
128kbps
Quality rating
64kbps
Quality rating
128kbps
Quality rating
96kbps
Quality rating

Figure 39.11 Example of a one-way related ANOVA

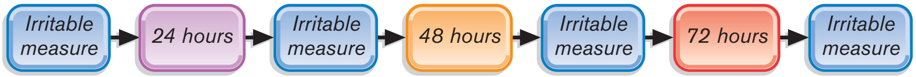

Irritable measure
24 hours
Irritable measure
48 hours
Irritable measure
72 hours
Irritable measure

Figure 39.12 Example of Friedman's ANOVA

doesn't tell us which groups differ from which. If the overall ANOVA is significant we should conduct *post hoc* tests. These are basically lots of *t*-tests that compare all of the different groups.

ANOVA is parametric and so is accurate only when the assumptions of parametric tests have been met.

Friedman's ANOVA

Friedman's ANOVA is used when you have one predictor that has several levels (three or more) and you have used the same people in each condition but the assumptions of parametric data have been violated. Like the Mann-Whitney, Wilcoxon and Kruskal-Wallis tests it analyses the ranked data rather than the raw scores.

Imagine we wanted to look at the effects of sleep deprivation on mood. We could prevent people from having sleep for 72 hours but measure their irritability after 24 hours and 48 hours. We could also measure their irritability before the study. So we have four experimental conditions: before, after 24 hours, after 48 hours, after 72 hours. Irritability could be measured in terms of how many times they told people to bugger off and leave them alone. The irritability scores were not normally distributed so ANOVA could not be used (see Figure 39.12).

Note that we haven't counterbalanced the orders: we have just measured people at four different points in time. This is known as a time-series design.

Friedman's ANOVA produces a test statistic that has a chi-square distribution χ^2, and we can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that the test statistic is big because there is a genuine difference between our groups. Like ANOVA, it doesn't tell us which groups differ from which. If the overall ANOVA is significant we should conduct post hoc tests. These would be lots of Wilcoxon tests that compare all of the different groups.

More than one predictor

Sometimes we have more than one predictor when we have used experimental manipulations. In these cases each of variables could be manipulated using the same people (a repeated measures design) or different people (an independent design), or a mixture (some variables use the same people and some use different people—a mixed design). In all of these cases we can use ANOVA to analyse the data. Depending on the number of predictor variables (variables we have manipulated) the name chances slightly. For example, a two-way ANOVA has two predictors, a three-way ANOVA has three and so on. Likewise we usually insert a word or two to describe whether the predictors were measured using the same or different people. So, if we had two variables and we used different people in all experimental conditions then we would call it a two-way independent ANOVA. If, however, we had manipulated two variables and used the same people in all experimental conditions then we would analyse the data with a two-way repeated measures ANOVA. A final scenario is that we manipulate two variables and we manipulate one of them using the same people, and we manipulate the other one using different people. In this case we use a two-way mixed ANOVA.

All of these ANOVAs have a lot in common. They will produce *F* statistics for the effect of each of the two variables (the same as if we analysed each variable separately in a one-way ANOVA). We get a test statistic for the interaction between the two. So, that's three test statistics in total!

We'll just look at one of these cases because they are all similar.

Two-way mixed ANOVA

Imagine we wanted to look at whether Lucozade (a glucose drink in the UK) really does enhance sporting performance. We got some volunteers and we put them on a treadmill and told them to run until they could run no further. We measured the time it took them to give up. Each person did the treadmill task twice: once after drinking nothing, and once after drinking Lucozade. However, so that we could see whether we were just getting a placebo effect (i.e. an effect caused by the fact you *believe* that Lucozade will make you run further and not caused by the fact that Lucozade actually does make you run further), we had a second group of people who did the same task except they only believed they were drinking Lucozade: in reality we game them something that tasted like Lucozade but had none of the nutritional value (see Figure 39.13).

This is a mixed deign: each person is in two conditions (i.e. they experience both 'drink' or 'no drink' conditions) and different people also engage in *different* conditions (Lucozade or placebo).

The resulting ANOVA will give us an *F*-value for the effect of Drink. That is, a difference caused by the fact that in some conditions people had a drink before running whereas on a different occasion they had no drink. If the *F* is sufficiently large, and the probability of this effect occurring by chance is less than 0.05 then we assume that this has happened because there is some difference in the

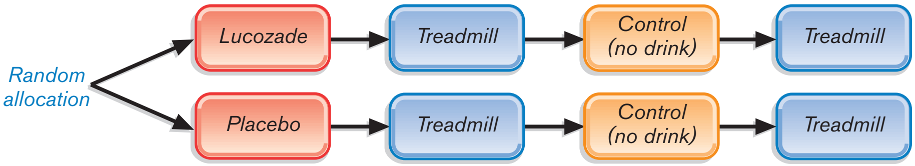


Figure 39.13 Example of a two-way mixed ANOVA

amount of running when people had a drink and when they did not. The expectation would be that people ran for longer when they'd had a drink (regardless of whether that drink was Lucozade or the placebo).

The ANOVA will also give us an *F*-value for the effect of Group. That is, a difference caused by the fact that some people drank Lucozade whereas others drank a placebo. If the *F* is sufficiently large and the probability of this effect occurring by chance is less than 0.05, then we assume that this has happened because there is some difference between the people that had Lucozade and those that had the placebo drink. The expectation would be that people ran for longer when they'd had Lucozade.

Finally we would get an interaction effect. This would tell us whether the effect of one variable was different at different levels of the other variable. Put simply, we could ask, is the difference in how long we run when we have a drink compared to when we don't different when the drink is Lucozade rather than a placebo drink?

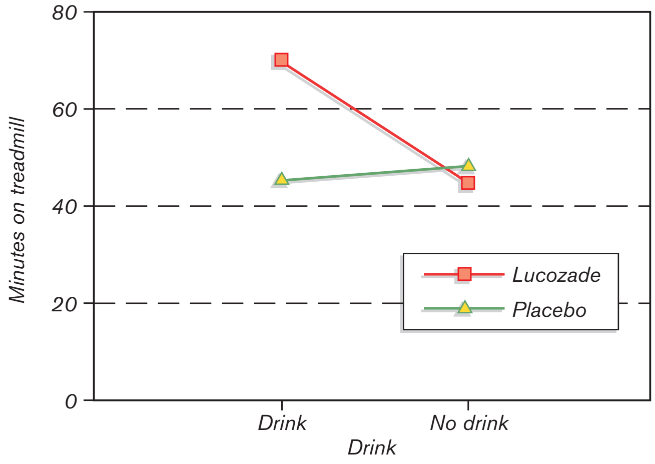


Figure 39.14 An interaction graph

Interpreting interactions

Figure 39.14 shows an interaction graph like we might get for our Lucozade example. A significant interaction just tells you that the effect of one of your variables is different at the levels of the other variable. So, with out Lucozade example, if we look first at the condition when nothing was drunk. It doesn't matter whether people were in the Lucozade condition or the placebo condition they ran for about the same amount of time (the triangle and square are in more or less the same location). So, when nothing was drunk, performance was the same.

Now let's look at when a drink was consumed. There's now a huge difference between the Lucozade and placebo group (the square is much higher than the triangle). Therefore, when a drink is consumed performance is different. This is all an interaction is.

Another way to look at this is to look at the slope of the lines. For the placebo group the line is very flat: it doesn't matter if they had a drink or not, they ran for about the same amount of time. However, for the Lucozade group this isn't true. The line is very sloped because when this group drank Lucozade they ran for a lot longer than when they didn't drink anything. Combine all this and we have shown that Lucozade did affect performance but the placebo did not.

When you have an interaction effect always draw a graph like this because it helps interpretation. There are a couple of general rules we can extrapolate from this example (see Field, 2009).

- Significant interactions are shown up by non-parallel lines on an interaction graph. However, it's important to remember that this doesn't mean that non-parallel lines automatically mean that the interaction is significant: whether the interaction is significant will depend on the degree to which the lines are not parallel!
- If the lines on an interaction graph cross over then obviously they are not parallel and this can be a dead giveaway that you have a possible significant interaction. However, contrary to what some textbooks might have you believe it isn't always the case that if the lines of the interaction graph cross then the interaction is significant.

TABLE 39.1 EXAMPLE OF THE CHI-SQUARE TEST

		Candidate		
		Tiddle	**Twazzock**	**Total**
Gender	Males	15	6	21
	Females	21	25	46
	Total	36	31	67

Categorical data

Chi-square

Sometimes we might have only nominal data; that is, we have collected information about the frequencies with which certain events occur. When we have frequency data we have to use a test called the Chi-square test (again devised by Pearson!).

Imagine you were interested in the number of people voting for two potential student representatives: Tiddle and Twazzock. We also broke down the voting by whether the voter was male or female. Now each person can be only male or female, and they can vote for only one candidate. Therefore, each number in the table below represents a quantity of people: for example, 6 different males voted for Twazzock, and 21 different females voted for Tiddle (see Table 39.1).

The chi-square test produces a test-statistic that has a chi-square distribution χ^2, and we can calculate the probability of that value occurring by chance given the data we have. If this probability is less than 0.05 then we conclude that there is a relationship between our variables. So, we would say that the distribution of males and females was different for Tiddle and Twaddle.

Summary

You are probably exhausted because this chapter has covered a lot of ground. We started off by looking at how we see whether summaries of our data (like the mean) are representative of our population by exploring the standard error and confidence intervals. We then moved onto look at the rational behind fitting statistical models. We saw that basically, we conceptualise our experimental and null hypothesis in terms of a statistical model that we then fit to our data. This model throws out some kind of test statistic, which is simply a statistic with known properties. Because we know the properties of the statistic we can work out whether a value as large as the one we have is likely to have occurred by chance assuming that the null hypothesis is true. We also saw that we can conceptualise the process in terms of merely establishing how large the effect we have is. Finally, we looked at a variety of different statistical models that we can apply in a variety of contexts. You now know everything you need to know to do some research☺

CLASS ACTIVITY BOX 39.2

Which test?

Get into small groups and for each of the examples in Applications box 37.1 decide which test would be most appropriate to analyse the data. When all of the groups have finished, have a discussion about each study. Does your group's answer concur with that of your classmates? If not, have a debate about why you came to your respective conclusions and try to agree on which of your answers is correct. Then check your answers with those below. Were you right?

Answers

Festinger and Carlsmith: Cognitive dissonance

This would be analysed with one-way independent ANOVA because there is one predictor (monetary incentive) with more than two levels (no incentive, $1, and $20). It's an independent ANOVA because different people were used in each of the incentive groups. If the data broke any assumptions then we could use the Kruskal-Wallis test instead.

Rosenthal and Jacobson (1966): Blame the teachers

This would be analysed with two-way mixed ANOVA because there are two predictors (the label attached to the child and the time at which IQ was measured). One is measured using different people (children were labelled either bloomers or not) and the other is a repeated measure (each child's IQ was measured at two points in time).

Greenwald et al. (1988): Implicit attitudes

This would be analysed with a related *t*-test because there is one predictor (the type of trial) with two levels (compatible trials vs incompatible trials). It's a related *t*-test because the same people see both types of trials. If the data broke any assumptions then we could use the Wilcoxon signed-rank test instead.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Explain how we use the standard error and confidence intervals.
2. Describe the use of hypothesis testing and its limitations.
3. Describe different experimental scenarios that would require data analysis using each of the following tests: t-test, Mann-Whitney test, Wilcoxon signed rank test, one-way ANOVA, two-way ANOVA, Friedman's ANOVA, the Kruskal-Wallis test.
4. Explain when correlations and regression should be used to analyse data.

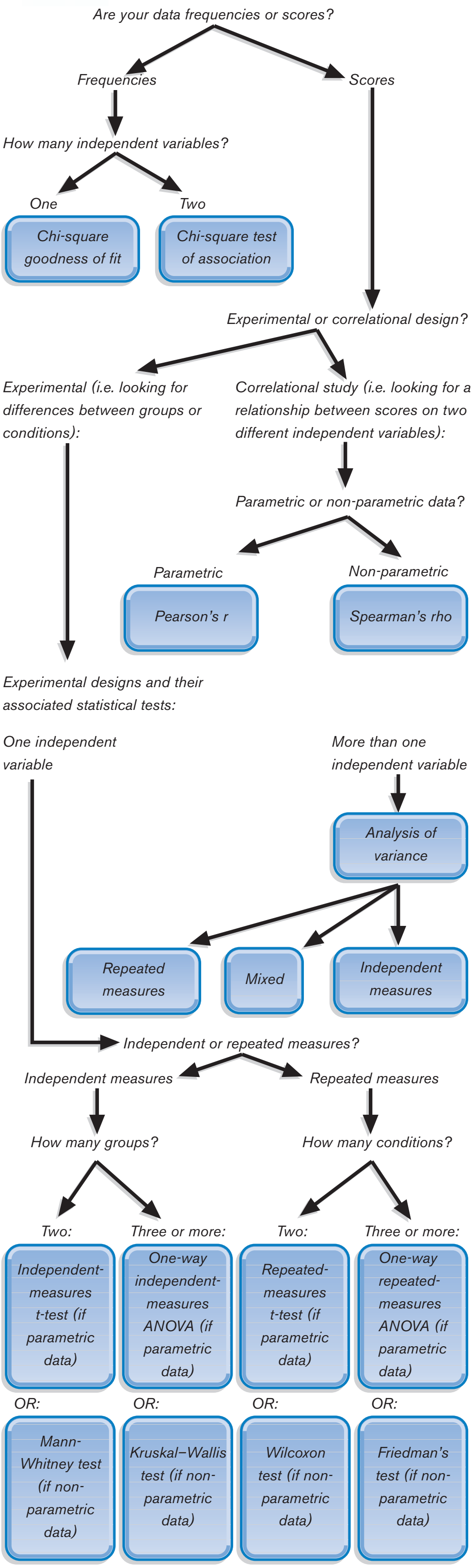

Are your data frequencies or scores?
Frequencies
Scores
How many independent variables?
One
Two
Chi-square goodness of fit
Chi-square test of association
Experimental or correlational design?
Experimental (i.e. looking for differences between groups or conditions):
Correlational study (i.e. looking for a relationship between scores on two different independent variables):
Parametric or non-parametric data?
Parametric
Non-parametric
Pearson's r
Spearman's rho
Experimental designs and their associated statistical tests:
One independent variable
More than one independent variable
Analysis of variance
Repeated measures
Mixed
Independent measures
Independent or repeated measures?
Independent measures
Repeated measures
How many groups?
How many conditions?
Two:
Three or more:
Two:
Three or more:
Independent-measures t-test (if parametric data)
One-way independent-measures ANOVA (if parametric data)
Repeated-measures t-test (if parametric data)
One-way repeated-measures ANOVA (if parametric data)
OR:
OR:
OR:
OR:
Mann-Whitney test (if non-parametric data)
Kruskal–Wallis test (if non-parametric data)
Wilcoxon test (if non-parametric data)
Friedman's test (if non-parametric data)

Figure 39.15 Which test do I use?

Further reading

Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.

Field, A. P. (2009) *Discovering Statistics Using SPSS: And Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage. Covers the theory of all the tests mentioned in this chapter in more detail than Rowntree and Wright but not as much as Howell!

Howell, D. C. (2006) *Statistical Methods for Psychology*, 6th edn. Belmont, CA: Duxbury. Very detailed on theory and quite advanced but really is one of the best books around.

Miles, J. M. V. and Banyard, P. (2007) *Understanding and Using Statistics in Psychology: A Practical Introduction*. London: Sage.

Wright, D. B. and London, K. (2009) *First Steps in Statistics*, 2nd edn. London: Sage. This book is a very gentle introduction to statistical theory.

Essay titles and references

1 What are the problems with the traditional ways in which psychologists use statistics to test hypotheses?

Cohen, J. (1990) Things I have learned (so far), *American Psychologist*, 45 (12), 1304–1312.
Cohen, J. (1994) The earth is round ($p < .05$), *American Psychologist*, 49 (12), 997–1003.
Field, A. P. (2009) *Discovering Statistics Using SPSS: And Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage
Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.
Miles, J. M. V. and Banyard, P. (2007) *Using Statistics in Psychology Research*. London: Sage.

2 Describe the different ways in which we can quantify the relationship between variables statistically. How do these statistics differ?

Field, A. P. (2009) *Discovering Statistics Using SPSS: And Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage
Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.
Miles, J. M. V. and Banyard, P. (2007) *Using Statistics in Psychology Research*. London: Sage.
Rowntree, D. (1981) *Statistics Without Tears: A Primer for Non-mathematicians*. London: Penguin.
Wright, D. B. and London, K. (2009) *First Steps in Statistics*, 2nd edn. London: Sage.

3 Think up and describe an experimental design that could be analysed with a two-way mixed ANOVA. Draw a graph of the interaction effect that you hypothesise and interpret what your graph shows.

Field, A. P. (2009) *Discovering Statistics Using SPSS: And Sex and Drugs and Rock n' Roll*, 3rd edn. London: Sage.
Field, A. P. and Hole, G. (2003) *How to Design and Report Experiments*. London: Sage.
Miles, J. M. V. and Banyard, P. (2007) *Using Statistics in Psychology Research*. London: Sage.
Rosnow, R. L. and Rosenthal, R. (1989) Definition and interpretation of interaction effects, *Psychological Bulletin*, 105 (1), 143–146.
Rosnow, R. L. and Rosenthal, R. (1991) If you're looking at the cell means, you're not looking at only the interaction (unless all main effects are zero), *Psychological Bulletin*, 110 (3), 574–576.

CLASS ACTIVITY 37.2 answers

1 The problem is that the control participants didn't complete the experiment (they ran away or were discharged). Therefore, for some of the data there was no control group to make the necessary comparisons that would allow us to say something about cause and effect.

sectionnine

Careers and study skills

40 Being a psychologist – Jon Sutton 603
41 Study skills in psychology – Annie Trapp 612

Careers and study skills

40

Being a psychologist

Route map of the chapter

This chapter will give you a brief introduction to some of the careers open to you as a psychologist. We will focus on areas with recognised training routes leading to the seal of approval that many employers require. Psychologists in each domain will give you a flavour of their lives, and we will conclude with some views on new opportunities and challenges that lie in wait if you decide to become one of the psychologists of tomorrow.

Introduction

When you first picked up this weighty tome, perhaps you already felt like a psychologist. Perhaps you were fascinated by what makes people tick – anyone from the brattish brother to the predatory psychopath. Now that you have started your studies and used this book, you have taken the first steps on the path that will take you from being an amateur psychologist to a professional one. How can you turn your new knowledge of psychological theory and research into a career in which you solve practical problems in society and improve people's quality of life?

This chapter can't give you a complete map of how to make it in your chosen career. Psychology is a thriving profession, changing all the time, and a lot of the detail you need is best kept on the website associated with this book: www.completepsychology.co.uk.

What this chapter will try to do is to give you enough of a picture of different areas to help you to decide whether you want to find out more. Along the way we'll meet psychologists working all around us – in schools, hospitals, prisons and workplaces – to find out how they have put the knowledge in this book to work, and what they love and hate about their jobs.

Where do all the psychologists go?

Psychology graduates are pouring out of universities as the popularity of the subject continues to rise. In 2005, there were over 10,500 new graduates. Can there really be jobs for them all?

In fact, only around 15 to 20% of psychology graduates end up working as professional psychologists, after obtaining relevant experience and postgraduate training in the roles covered in this chapter (see www.prospects.ac.uk for the latest figures). But this doesn't mean that the majority of graduates do not use what they have learnt. On the contrary, many employers recognise and appreciate the skills a psychology graduate has gained (see Class Activity Box 40.1).

CLASS ACTIVITY BOX 40.1

Skills gained by a psychology graduate

Consider the skills you are picking up in your course, and how they might map on to what employers are looking for.

Now download the Higher Education Academy's 'student employability profile' for psychology, from www.tinyurl.com/yv4xx2, to see just how much psychology graduates have to offer.

According to Liz Campbell, President of the British Psychological Society 2008–2009, 'there are some great opportunities as a professional psychologist, but there are also plenty of ways you can use your degree elsewhere. Employers recognise and value the scientific grounding, statistical know-how and critical thinking skills that a psychology degree provides.'

Of those graduates who go into permanent employment as psychologists, a third enter public services (such as the health service, education, the civil service and the armed forces), and a third go into industry or commerce (market research, personnel management etc.). Of the remainder, about a tenth teach and research in schools, colleges and universities.

This chapter will cover areas in which a recognised training route has developed over the years, leading to membership of a Division of the British Psychological Society and eligibility for the Register of Chartered Psychologists. Employers have historically preferred to appoint a Chartered Psychologist because the title served as the public's guarantee that the person is properly trained and qualified, and answerable to an independent

CLASS ACTIVITY BOX 40.2

Which area is for you?

Although the areas of psychology may seem fairly specialist, psychologists working in any of these settings are likely to use knowledge from right across the breadth of this book.

Clinical psychologists will draw heavily on their knowledge of psychological disorders and therapies, but they will also be thankful they were listening in lectures on, for example, attention and psychobiology. A forensic psychologist trying to understand a young offender would need to consider a range of factors, potentially applying their knowledge of personality, developmental psychology, and social influence and group processes.

As you read the following accounts from specialist psychologists, take the time to flick back through the book and consider what areas would feed into your practice if you chose to go down each route. Are they the areas of psychology you have enjoyed studying? You would be well advised to ensure that they are. Heed the advice of Simon Moore in his chapter on motivation – money is all well and good, but to remain fascinated and absorbed throughout a long career you need intrinsic motivation!

professional body. There has been considerable development in this area in recent years, and psychology is on the cusp of regulation by a statutory, government body, the Health Professions Council (www.hpc-uk.org). However, the main specialisms of psychology are likely to remain as:

- clinical psychologists, working in health and care settings
- counselling psychologists, in private practice and commercial settings
- educational psychologists, in local education authorities, schools and special schools
- forensic psychologists, working in penal establishments, special hospitals and with young offenders
- health psychologists, working in hospitals, health authorities and health research departments
- neuropsychologists, helping people with brain injury
- occupational psychologists, in management, personnel, training, selection and careers services
- sport and exercise psychologists, working with individuals and teams at all levels, and with doctors' surgeries to encourage exercise in the general population
- teaching and research in institutions of higher education.

Clinical psychology

Psychology is a helping profession, and perhaps nowhere is this more evident than in the field of clinical psychology, which aims to reduce psychological distress and promote psychological well-being. It's demanding work. You would deal with a wide range of psychological difficulties and serious mental illnesses, including phobias, depression and schizophrenia.

Clinical psychologists work largely in health and social care settings, including hospitals, health centres, community mental health teams, child and adolescent mental health services, and social services. They usually work as part of a team with, for example, social workers, medical practitioners and other health professionals. Most clinical psychologists work in the National Health Service, but some work in private practice. Others work as trainers, teachers and researchers in universities, adding to the evidence base of the profession.

Photo 40.1 Could you get them to stroke it?

The work is often directly with people, assessing their needs and providing therapies based on psychological theories and research. But as Glenda Wallace (a UK psychologist now working with Otago District Health Board in Dunedin, New Zealand) explains, these people can be a great resource themselves:

> You are face to face with another human being who can bring you richness, and if you are lucky you can give them something back. This is not dismissing our profession, but acknowledging that people are a wonderful resource even without the wealth of theory under their belt that we are supposed to have.

Places for training are in short supply and a first- or an upper second-class degree is required. A clearing house scheme then operates for applications to all clinical psychology training courses. Candidates make one application to the Clearing House for Postgraduate Courses in Clinical Psychology (see www.leeds.ac.uk/chpccp), which is then distributed to their selected institutions. Application packs and handbooks are available from September to December for courses commencing in September/October of the following year.

Relevant experience is also important: this could involve working as a psychological assistant, research assistant or care nurse/assistant, either before or after graduation. Some graduates get their foot in the NHS door by working as an assistant psychologist on a voluntary basis, or get involved in charities working with mental health client groups.

After this challenging start, job opportunities for qualified clinical psychologists are good. Salaries start at around £24,000 but can rise to over £85,000 for senior experienced psychologists managing departments or large specialist sections.

Counselling psychology

If you love to talk people through their problems – really get to the bottom of them – perhaps you should consider counselling psychology. You would work with others to explore issues underlying a diverse range of human problems. How, for instance, would you go about helping a man who had just lost his wife of 50 years? Perhaps more importantly, how would you help him to help himself?

As human problems are pretty universal, you could end up working virtually anywhere. Counselling psychologists work within the NHS, in general and psychiatric hospitals and GP surgeries; in private hospitals and in independent practice; within education in schools, colleges and universities; in industry and in public and private corporate institutions. It's this diversity that keeps Linda Papadopoulos (London Metropolitan University) hooked:

> I've done everything from work on acute psychiatric wards and GP surgeries, to giving lectures to dermatologists and plastic surgeons. I've battled with statistical analysis, travelled all over the world to listen to and talk about research, even sat on Richard and Judy's couch! The fact is my day is never boring. Whether working with patients, doing research or giving a comment to the media, I get to tap into my knowledge of counselling psychology and apply it in so many ways that I always feel challenged and excited about my work.

Postgraduate training is most likely to be self-financed and total costs (including fees) will be approximately £5000 per year. Institutions may be able to provide information on Research Councils and other funding agencies (such as charitable trusts, foundations and companies).

Based on the nationally agreed scales for clinical psychologists, counselling psychologists should expect to receive anything from £24,000 to £85,000, depending on age, experience and level of responsibility. For counselling psychologists working as lecturers the nationally agreed lecturers' scales apply.

Educational psychology

The small girl sits sullenly in the corner, her education (her future?) slipping away before the teacher's eyes. What's her problem? Can you find it? Can you solve it?

As an educational psychologist you would tackle all kinds of problems encountered by young people in education, from learning difficulties to social or emotional problems. Work can be either directly with a child (assessing the problem through observation, interview or test materials, or giving counselling) or indirectly (with parents, teachers and other professionals).

The majority of educational psychologists are employed by local education authorities (LEAs), working in schools, colleges, nurseries and special units. They liaise regularly with other professionals from the departments of education, health and social services. A growing number work as independent or private consultants.

The path to becoming an educational psychologist in England, Wales or Northern Ireland is via a degree, followed by a three-year, full-time, professional training course leading to a Doctorate in Educational Psychology. This training will comprise academic and practical experience. The postgraduate training route for Educational Psychologists in Scotland involves a two-year, full time MSc in Educational Psychology, followed by one year supervised practice. The very competitive postgraduate training courses look for candidates with 'relevant experience': usually with children in education, child care or community settings.

Remember, though, that a rewarding job awaits you at the end of this long route to qualification. Kairen Cullen, an independent educational psychologist, says:

> This is, unarguably, a satisfying and rewarding occupation and will use an individual's academic and personal qualities to the full. Most important of all, in my view, is the possession of a total commitment to one's own learning and ongoing development.
>
> The psychological processes around how individuals, groups and organisations function most effectively – cope with and use difficulties constructively and learn – are complex and fascinating. As an educational psychologist I use my knowledge of psychological theory, training in hypothesis formulation, and testing and analysis, and create unique solutions for unique problems.

Forensic psychology

Sue Johnston in *Waking the Dead*, Robbie Coltrane in *Cracker* . . . each year when the figures show another rise in the number of applications to study psychology at university, you can be sure the newspapers will chuck in a picture of one of them to explain it. There's no doubt that depictions of forensic psychology on TV and in books have encouraged some people into the profession, but is the job all it's cracked up to be?

'The work of a forensic psychologist is much more diverse than that depicted by the media,' says Jane Ireland, a Forensic Psychologist at the University of Central Lancashire and Ashworth High Secure Hospital.

You may be disappointed if you see yourself as a full-time 'offender profiler', helping the police catch criminals. But if you're interested in working with challenging groups of individuals, in developing and delivering offending-behaviour programmes, working with victims, conducting in-depth offender assessments to inform on decisions about the risk an offender poses to themselves and the general public, in training staff, conducting applied research and providing a consultancy service, then this may be the profession for you.

As a forensic psychologist you could find yourself drawing on a range of areas in this book, including those on memory (allowing you to assess the reliability of eyewitness testimony), the developmental and social psychology of the self and others (giving you an insight into possible influences on offending across the life span), intelligence and psychometric testing (knowledge you might use to assess offenders) and psychological disorders (which often accompany offending behaviour). You could put this know-how to use in a variety of forensic and legal contexts, from criminal investigation, through courts and mental health tribunals, to understanding and treating criminals (e.g. anger management or social skills training) and victims.

There's clearly a lot riding on this type of work and, according to Professor Ireland,

> 'It is not a career that should be taken lightly. We often find ourselves making decisions that impact significantly on others. The compilation of forensic risk assessments, for example, can contribute to the length of time that an offender or patient will remain detained. It's also not a career for those seeking a "9 to 5" job or whose primary wish is to make individuals "better". Rather, the focus of some psychological intervention with offenders, for example, is on making them "safer" for their eventual return to the community and in doing so increasing their quality of life. This can be one of the hardest lessons learned by those new to the profession. You either accept the reality of how difficult the work can be or become disillusioned with it and seek a career within another branch of applied psychology.'

To become a forensic psychologist, you will need your accredited degree followed by an MSc in Forensic Psychology plus stage 2 of the BPS Diploma in Forensic Psychology (comprising a minimum of two years' supervised and assessed practice). There are also accredited doctorate programmes coming on line which combine these two steps into a single qualification.

HM Prison and Probation Service (which includes the Home Office Research and Development Unit and National Offender Management) is the largest single employer of forensic psychologists in the UK, and further information on the training, work, pay and recruitment of forensic psychologists can be found at www.hmprisonservice.gov.uk. Forensic psychologists can also be employed in the health service (including rehabilitation units and secure hospitals), the social service (including the police service, young offenders units and the probation service), and in university departments or in private consultancy.

Health psychology

'Just say no!', 'If you do drink, don't do drunk', 'Smoking kills', 'Eat five a day' . . . We are constantly bombarded with health-related messages, and the relatively new field of health psychology uses theory and research to make sure they work, and to understand *how* they work.

Charles Abraham (University of Sussex) explains how psychological principles are used to promote changes in people's attitudes, behaviour and thinking about health and illness:

> Many professionals aspire to change people's health behaviour. Health psychologists work on understanding *how* behaviour change happens; how the processes that underpin behaviour patterns and behaviour change can effectively be altered. So in the case of preventive health behaviours (such as using condoms) and adherence to medical advice (e.g. taking medication as directed) health psychology research can help professionals offer their patients and clients the right advice in the most effective manner. For example, we have analysed the messages contained in leaflets promoting condom use and moderate alcohol use across a number of European countries. We were able to distinguish between research-based leaflets (which are more likely to be effective) and those containing messages that do not correspond to the psychological antecedents of behaviour change. This work provides guidelines for the production of health texts and helps to establish a foundation for evidence-based health promotion practice.

Following a British Psychological Society accredited qualification (usually a Masters and two years' supervised practice), health psychologists find work in a number of settings, such as hospitals, academic health research units, health authorities and university departments. They may deal with problems identified by healthcare agencies, including NHS Trusts and Health Authorities, health professionals such as GPs, nurses and rehabilitation therapists, and organisations and employers outside the healthcare system.

Posts are not necessarily advertised as being for 'health psychologists'. Employers may request applications from

FOCUS POINT 40.1

The reality of TV

Many of you will have had your first contact with psychology and psychologists through reality television shows such as *Big Brother*. So what is it like to be a psychologist working on one?

Tomas Chamorro-Premuzic (Goldsmiths, University of London) has made regular appearances on *Big Brother*. He says:

'TV is not as glamorous and well-paid as people may think. All producers work within a specific budget and would always try to pay as little as possible. Their compensatory weapon is "exposure", but most psychologists are weary or even afraid of this!

The result is a bad cocktail of demanding producers who want top scientists that are able to communicate complex ideas to a low level audience (well, quite often not as 'low level' as they think it is), and snobbish academics who hate or pretend to hate the media. This leads to a clear imbalance between the media's need for top psychologists who are approachable and good communicators and the supply of such professionals. This explains why more often than not, we see bogus psychologists discussing clichéd topics on TV.

This is not to discourage people. Quite the contrary: there is a lot of room in the media for psychologists and given the wide scope of application of this science the opportunities are unlimited. The more serious academics we get on board, the bigger the snowball effect will be and the more realistic the goal of making psychology a useful tool for society – if only to encourage debate about topics of interest which have psychological relevance.'

psychologists with the relevant skills to work in the health area, such as clinical or counselling psychologists, or from health professionals in general.

Neuropsychology

Imagine you are in an accident and your brain is injured. If you can't remember your life pre-injury, including giving birth to your son, how do you relate to him now? Or if you can't lay down new memories – you're stuck in the past – what is your emotional life like? If you can only respond with an eye blink, how do you share your thoughts with others?

These are the kinds of questions that fascinate Camilla Herbert, a Consultant Clinical Neuropsychologist with the Brain Injury Rehabilitation Trust and Hurstwood Park Neurological Centre. She says:

> Neurorehabilitation is about people struggling with events and injuries that none of us would choose to endure. The courage and resilience that many people show is inspiring, and compensates for the day-to-day frustrations of slow progress, chaotic lives and missed appointments. What can you expect? The joys of home visits, sitting on vaguely damp sofas drinking brown liquids out of dirty cups . . . talking with families about the changes they are experiencing, laughing with a client as they describe their latest memory failure, whether it was leaving the dog outside the post office or a bucket of dirty water in the boiler cupboard 'to come back for later'.

Professor Barbara Wilson OBE also points to 'the intriguing mixture of normality and abnormality that one finds in neuropsychology. Most people with neuropsychological impairments are not psychiatrically disturbed, they do not have developmental learning difficulties, they are people who have sustained an insult to the brain that has resulted in specific problems to be examined, understood and alleviated in some way.'

Neuropsychologists most commonly work in acute settings, concerned with the early effects of trauma, neurosurgery and neurological disease; in rehabilitation centres, providing post-acute assessment, training and support for people who have sustained brain injury, or who have other neurological problems; and in community services, supporting those who have returned to community living.

Research is an important aspect of neuropsychological practice. In fact, Professor Wilson believes that 'neuropsychology is a wonderful field if one wants to combine theory and practice. It is a broad discipline encompassing many theoretical models and approaches, and it welcomes creativity and flair in adopting and adapting theories and models in the quest to improve the lives of patients and their families.'

Specialised training in neuropsychology is currently based on prior training in one of the other areas of applied psychology, so graduates interested in entering neuropsychology are advised first to seek a professional qualification in clinical psychology (or educational psychology if they are interested in paediatric neuropsychology). This generic training provides neuropsychologists with knowledge about mental health issues, gives them expertise in dealing with emotional and psychosocial problems, provides training in working with families, and develops an understanding of the different psychological models that underpin our work.

There is a serious national shortage of neuropsychologists, most acutely in paediatric neuropsychology, and prospects for professional advancement are very good. Pay is on the same scales as for clinical psychologists, but many senior neuropsychologists substantially supplement their income by undertaking private medicolegal consultancy as expert witnesses in personal injury cases.

Occupational psychology

If you want to use your psychological knowledge to change the lives of large numbers of people in one shot, perhaps occupational psychology is for you. The wheels of industry are oiled by happy workers, performing to the best of their ability in a safe and healthy environment. This is where you would come in as an occupational psychologist. What psychological knowledge would you use to increase the effectiveness of organisations, and to improve the job satisfaction of the individual?

Occupational psychologists usually work alongside managers, trades union representatives, training officers and specialist staff from the firm or industry concerned. Their work is broad, touching on research from the social psychology, personality and intelligence sections of this book, as well as related disciplines such as ergonomics and personnel management.

Work can be in advisory, teaching and research roles and, to a lesser extent, technical and administrative roles. You could find yourself doing anything from creating a new image for a company, to teaching leadership and conflict resolution, to increasing awareness of ethnic minorities, women and people with special needs.

Frank Bond, an Occupational Psychologist based at Goldsmiths, University of London, thinks size matters. He says:

> The best thing about occupational psychology is that I get to have a positive impact on a large number of people. I work with big organisations to find ways of helping them make their workplaces less stressful but, at the same time, more productive. This is very challenging, but so rewarding when you get it right.

Of course, the downside of working with large, sometimes multinational, corporations is that they can seem like a closed shop. You may really have to 'sell' what you have to offer. 'I sometimes feel like a travelling salesperson, selling my wares,' Professor Bond admits. 'Dealing with the inevitable rejection, and thus wasted time, is not the best bit of my job.'

Photo 40.2 Could you train a manager to keep his staff motivated and task-focused?

Some would argue that big business is becoming increasingly 'person focused' in the drive for profits, and the services of occupational psychologists are certainly in demand. Rewards can be high: there is perhaps more variation in salary in this area of psychology than in any other. A trainee may earn just £20,000, but a senior psychologist in the private sector can earn well over £100,000, particularly when consultancy work is taken into account.

Sport and exercise psychology

Imagine combining a love of sport and exercise with the psychological theories you have learnt about, in order to push your client that fraction of a second closer to Olympic gold, or simply out of the door for a walk.

Over the last ten years opportunities in this area have exploded. There is now a recognised training route (see www.bps.org.uk/sport), and psychological input has been transformed in the eyes of the public from fringe fad to an essential element in the changing room, training ground and GP's surgery.

Sport psychologists work across a range of team and individual sports, and from amateur to elite levels of competition. They might work with a Premiership footballer to increase levels of confidence using an imagery intervention; advise a swimming coach on how to build squad cohesion; or help athletes to deal with the psychological and emotional consequences of injury.

According to Marc Jones (Staffordshire University),

> 'Working with athletes can be a very positive experience as you help them achieve their potential. However, this can sometimes be challenging as athletes may perceive working with a psychologist as a sign of weakness. Demystifying sport psychology and reassuring athletes that the symptoms and feelings they experience are common can therefore be an important part of any intervention.'

An exercise psychologist applies psychology to increase exercise participation and motivational levels in the general public. For example, they might work with depressed people to set exercise-related goals, help menopausal women to improve self-esteem through exercise, or set up and evaluate an exercise programme in a workplace, prison and psychiatric context.

Amanda Daley (University of Birmingham) says that it is exciting to see people change through exercise. 'This is especially true since, quite often, you're asking a lot. These people may well have been sedentary for months or years. When you first tell them about the benefits of exercise they may be scared or resentful. Sometimes they don't accept what you're saying. You have to overcome the common view that "rest is best" after an illness. You have to accept that progress will not be quick, or uniform. And sometimes you fail. Anyone entering the profession needs the ability to cope with this.'

Pay and opportunities vary considerably, reflecting the diverse nature of the field. Although full-time opportunities are increasing, most practitioners see it as a 'portfolio career', combining consultancy, teaching and research. Marc Jones loves this diversity. 'You can find yourself giving a lecture, writing a book chapter, conducting research, speaking to the media or consulting with a sport or exercise participant. It is enjoyable, challenging and particularly when consulting can be a very rewarding experience.'

Teaching and research

David Shewan (Glasgow Caledonian University) isn't your stereotypical bearded, shuffling Prof with tatty tweed jacket adorned with leather elbow patches. He spends a lot of time in the pub. 'Much of my job involves waiting around in Glasgow bars in order to talk to interesting people,' he explains.

'Then I go back to university and tell all (well, mostly all) about this and get paid for it. Sometimes I hang about in jails instead of bars, but the rest remains the same. The people I talk to are drug users, sometimes drug dealers. I summarise and analyse what they tell me, get it published and incorporate it into lectures.'

This is a good example of how teaching and research in psychology usually go hand in hand. Some teaching staff will have qualified in one of the applied psychological professions already mentioned. They may return to teaching to develop professional practice and conduct research, or simply to share their knowledge. All university lecturers are expected to help extend their subject by gathering psychological evidence on key research questions, and then disseminating it through journal articles, conference presentations and books. Securing funding for this research is a vital part of the career of a teacher and researcher of psychology.

Teachers and researchers usually have to be administrators too, although most would rather not be. Admin can take up a great deal of time. It includes student selection, devising new teaching programmes, sitting on committees that allocate resources and coordinating aspects of the life of the department.

Lynne Dawkins (University of East London) admits that 'the admin can be a nightmare – so much paperwork you can forget which way your head's screwed on – but you accept it as everyone has their fair share. The teaching has its ups and downs but is really worth it when students get enthusiastic about the subject area and it's a great feeling when you get positive feedback about something you've taught. But it's the research that I really enjoy – the freedom and flexibility to explore those nagging questions about human behaviour, and the opportunity to discuss these ideas and findings with colleagues at conferences. It really is a great way to earn a living.'

If you go down the academic path you will get a taste of this freedom and flexibility while studying for a PhD; most applicants for lecturing posts have one. Essentially an attempt to answer an original research question under the supervision of an established academic, a PhD is a rite of passage that can vary wildly depending on the way you work, the way your supervisor works, even the way your finances work.

If you are not used to ploughing your own furrow and you have a supervisor who favours the hands-off approach, you might find yourself tearing out clumps of hair in front of a computer screen, wrestling with some complicated statistical analysis or struggling to commit your dissertation to paper, one tortuous sentence at a time.

If you have found an area you love, however, a question that genuinely interests you, a productive relationship with your supervisor, and funding or part-time work to take the pressure off your purse strings, then your time as a PhD student can be a delight of independent intellectual endeavour that will give you a flying start in your academic career.

See www.bps.org.uk/careers for information on postgraduate research, details of potential supervisors, and funding resources. This funding can be particularly important given that a newly qualified lecturer can start on just £28,000; salaries for academics have struggled to keep pace with comparable professions in recent years. The scale for professors starts at around £45,000, and some supplement this with consultancy or expert witness work. In addition, the idea of long holidays may be misleading – many academics find that the long summer 'break' is the only chance they get to crack on with their all-important research.

Many schools and sixth-form colleges of further education now offer psychology as a subject at GCSE and A-level/Scottish Higher. Teachers work to an exam board syllabus, but there is considerable choice in what to offer and in terms of practical coursework projects. You'll need a PGCE to teach psychology in a state school; formal qualifications in psychology are not always required. In fact, psychology graduates sometimes find it difficult to find places on PGCE courses because psychology is not a National Curriculum subject.

For more information contact the Graduate Teacher Training Registry or the Teacher Training Agency (www.teach.org.uk).

The future

Hopefully, you will now have a healthy stash of psychological knowledge and a good idea of how it is possible to make your living putting it to use. But is the profession in good health? How will opportunities for graduates change in the coming years?

CLASS ACTIVITY BOX 40.3

Qualifications and experience

Buy the *Guardian* on a Tuesday and look in the Education supplement. What kinds of qualifications and experience are needed for the psychology lecturer posts?

There are several reasons to think that career prospects for psychologists will continue to expand and improve. First, the undergraduate entry levels for psychology are high within most universities, so psychology students tend to be academically capable from the start. Second, the BPS requirements for the psychology curriculum ensure that university courses generally provide a mix of training in scientific methods, written communication, IT skills, and statistical know-how. Psychology graduates and postgraduates have a tremendous range of skills that employers in many organisations are looking for.

In addition, employers in the public and private sector are also finding that psychological knowledge and expertise is often what they need to deal with behavioural questions, and the financial value of being able to anticipate people's behaviour is central to the marketing strategies of most large commercial and retail organisations. Finally, as the organisation and structure of political and social life become more flexible and less dominated by particular political ideologies, people seem to be increasingly interested in the psychological dimension of one another's decisions, actions and fate.

Psychology is fast becoming the major means of interpreting and understanding what society has been, is and what it may become. We are seeing applied psychologists taking an increasingly leading role in education, health, social care, justice and the workplace. More government money is being pumped into training in order to improve access to psychological therapies. And we are seeing a rising tide of professionalism, led by the BPS and continued by the government's 'Statutory Regulation' of psychology through the Health Professions Council.

It is hard to predict the impact of statutory regulation on psychology, but one possibility is more flexible, modular-based training that is not necessarily tied to the divisional descriptors currently in use. Boundaries will be blurred and the current adjectival descriptors may fall into disuse as the profession come to see themselves first and foremost as 'applied psychologists'.

So, remember all those subheadings you just worked through? Don't get too hung up on them. They are the current recognised training routes, but psychology is expanding into new areas all the time, such as coaching psychology. It's an exciting time to be embarking on a career in psychology.

The best way to give yourself the start you need is to talk to people. Talk to other psychologists: find out what they love about their jobs, think about whether you would love that too. In fact, just talk to anyone – perhaps you'll come across a human problem and you will remember an approach or a piece of research from this book and, before you know it, you are a pioneering figure in a completely new area of psychology.

As a science and as a profession, psychology is still relatively young. It's up to you to make an impact and help people in the process.

Learning outcomes

When you have completed this chapter, you should be able to:

1. List the different professional specialisms within psychology.
2. Comment on how these areas relate back to some of the research areas you covered in previous chapters.
3. Visit the relevant websites for further information about the specific training routes in psychology.

Further reading

Handley, J. (2002) *Getting into Psychology*, 4th edn. London: Trotman.
So you want to be a Psychologist? Leicester: British Psychological Society; also available from http://www.bps.org.uk/careers

Web links

www.nhscareers.nhs.uk – information about jobs in the NHS.

www.psychapp.co.uk – the latest jobs in psychology.

www.psychology.heacademy.ac.uk – the Higher Education Academy's Psychology Network.

www.psyclick.org.uk – for prospective clinical psychologists.

www.thepsychologist.org.uk – the home of the British Psychological Society's *Psychologist* magazine, featuring careers-related articles.

Careers and study skills

41

Study skills in psychology

Route map of the chapter

This chapter is intended to do two things. It aims to help you with your study during your psychology degree course: for example, how to get the most out of working in groups with others, how to go about structuring an essay and how to approach revision for an exam. It also aims to illustrate how and why psychological knowledge is relevant to studying – so after reading the chapter you may know a little more about psychology as well as a little more about studying. The coverage is necessarily selective because of space limitations. Nevertheless, we hope that the rationale and the examples provided will help you develop more extended study skills. The chapter starts with some preliminary definitions and then introduces five key principles for study. These principles are based in psychology theory and research. The chapter then gives examples of the application of these principles within a number of common study activities, such as attending lectures, writing reports, revision, taking exams and accessing information resources.

Introduction

How you study matters. Suppose you wanted to improve how well you could recognise and remember people's faces. You might feel a reasonable approach would be to learn how to categorise different features of faces (such as different types and sizes of noses, different colours and shapes of eyes, and so on), and then practise using this categorisation scheme to 'code' particular faces you wanted to remember. This is a technique that has long been used for training the police and others to improve how well an individual can remember faces. However, it turns out that when people are trained according to this method, they can actually become worse at remembering faces than a group of people who have had no training at all (Woodhead, Baddeley and Simmonds, 1979).

This is a rather extreme example of an ineffective study skill, but serves to make a couple of points. The first is that it's not always obvious just what the best way to go about studying a particular skill is. The second is that an understanding of the psychological principles that underlie the particular study skill may help in deciding what techniques might be the most effective. In the case of learning to recognise faces, the training method is based on a misguided principle. Adults are generally highly skilled at perceiving and recognising faces, and this skill is based on the overall pattern of the features. So adopting an approach of focusing on individual features probably disrupts the smooth running of our normal face-recognition skill, and that's why it can degrade performance.

So considering study skills from a psychological perspective is relevant not only because this may help you study better but also because it illustrates a practical application of psychology. In turn, an appreciation of *why* particular approaches to study can be effective may help you think about, choose and apply the right study methods for the right circumstance – and as you get more skilled, your study skills will become more refined and automatic.

What are study skills?

There is a good deal of educational jargon around the term 'skill'. You may have come across 'basic skills', 'key skills', 'transferable skills', 'critical thinking skills', 'employability skills', maybe even 'metacognitive skills'. There's a danger that skills of this sort are seen as optional extras, perhaps largely irrelevant to your course and hard to apply in real situations. However, for psychologists skills are an object of study in their own right.

In this chapter we are concerned with study skills which are very much embedded in the learning activities that make up typical psychology degree programmes. That is, skills that, directly or indirectly, result in more effective learning.

In your course you will attend lectures, during which you may well take notes. You will take part in small-group discussions sessions, and make presentations to the group. You will be required to write essays and reports, read and summarise research papers, find evidence from a variety of sources, revise for and take exams, and more . . . and make

FOCUS POINT 41.1

Three categories of skill relevant to the study of psychology

Prerequisite skills

These are skills that you are generally assumed to have acquired before starting your course. They include relevant literacy, numeracy and IT skills (often termed 'key skills'). You will also be expected to have some basic skills in such areas as critical analysis of materials you read, note-taking, essay writing, and communication and presentation skills. You will be expected to improve these skills during your course.

Graduate skills

These are skills you are expected to learn during your course. They include both general skills, such as teamworking skills or good analytical and communication skills, and more psychology-specific ones, such as psychology research skills or technical ability with statistical analysis. As a graduate you are not only expected to know the facts from your course (the discipline knowledge), but also to be able to demonstrate a set of skills that can be applied and used within the world of work (hence the term 'transferable skills'). Some of the skills psychology graduates are expected to have are listed in a guidance document for all psychology courses in the UK, known as the 'the subject benchmark statement'. You can see this on the web at: www.qaa.ac.uk/crntwork/benchmark/phase2/psychology.pdf.

Study skills

These are the skills that help you deal most effectively with the activities involved in your course. The particular skills involved will naturally depend on what you want to get out of the course and what forms of study are most effective for you. Some will be general purpose, others will be more psychology-specific. For example, tips on how to make the best of lectures or of small-group teaching would probably be much the same were you studying psychology, geography or biology. However, how best to structure a practical report, or how to evaluate psychological evidence, will be more specific to the discipline.

sense of and learn from all these activities. You may already be pretty good at some of them but probably not all of them.

Study skills are concerned with working in a variety of ways to optimise learning. Do you know what techniques will help? For example, in the limited time before an exam, what's the best way to revise and what suits your particular style of learning?

It's important to distinguish three related classes of skill that are relevant to studying for a psychology degree: prerequisite skills (which you are generally assumed to have when you start your course), graduate skills (which you are expected to acquire during the course) and study skills (which help you study effectively during the course). It is the last category – how you go about studying – that is the focus of this chapter.

Focus point 41.1 provides some further details and examples of these three categories of skill.

In this section we have indicated that study skills can be of benefit on your course in two ways. They can be applied directly to your learning activities (e.g. 'it's a good idea to think of concrete examples based on your life experiences'), but also they provide a framework for you to reflect about your study methods in view of your own strengths and weaknesses, goals and preferences (e.g. 'I tend to be better at practical applications than at comparing theories, so I'll look for exam questions that best match my strengths'). In the next section we consider briefly some of the principles underlying study skills that relate directly to effective learning.

Five key principles for study

Learning at university level is becoming more student-centred. For example, you may well find that, compared to studying for A-level psychology, studying psychology at university involves much less direct input from the teacher or tutor. You are expected to take more of a lead in getting on with studying on your own or working with other students.

This change in emphasis is in part a result of the belief that learning to take responsibility for one's own learning is seen as a desirable skill in itself, but it would be disingenuous not to mention other factors too: the changes in the funding of higher education, the increasing availability and accessibility of electronic resources to support self-study, and not least the changes in social and political attitudes towards a more market-driven approach to education. Whatever the reasons, there is an increasing pressure on you, the student, to be an independent learner and take responsibility for your own learning.

Student-centred learning doesn't necessarily mean more time working on your own. Many departments are placing increasing emphasis on collaborative or group-based activities, such as student-led discussion groups,

TABLE 41.1 FIVE KEY PRINCIPLES FOR EFFECTIVE STUDY; LISTED UNDER EACH PRINCIPLE ARE A NUMBER OF RECOMMENDATIONS RELEVANT TO THE PRINCIPLE

Principle 1 Stay relevant	Principle 2 Maximise meaning	Principle 3 Be active	Principle 4 Be reflective	Principle 5 Play to your strengths
The longer the study of factual material, the more is retained	Capitalise on your existing knowledge	Learning-by-doing enriches learning-by-studying	Think critically at all levels – about your goals as well as about the details of your work	Identify your learning preferences and learning styles
Spacing out learning with breaks is more effective than unbroken study	Develop encoding and retrieval schemata to help you memorise	New things are hard: don't panic, get feedback, keep trying	Evaluate your current work and skills against your goals, and plan what to address	Adapt your strategy to suit the learning situation
Maintain your interest and attention	Think about what you are learning from different perspectives: elaborate and differentiate	Identify the components of a skill or task that require the most practice	Reflect on and share your aspirations and progress with others	Adapt your strategy to suit the learning situation
Understand and stay relevant to your personal goals and perspectives				

collaborative problem-based learning or enquiry-based learning. The days of weekly individual or small-group tutorials with members of staff may be gone in many universities, but staff input continues through lectures, larger group sessions, and individual support and advice through occasional electronic or face-to-face contact. Generally speaking, however, departments expect students to be motivated to study their subject and to have, or be able to develop, the skills for working independently and effectively.

In this chapter we separate study skills into two categories, as follows.

1. Skills that are intended to maximise understanding and learning from teaching and study activities typical of most psychology courses: lectures, note-taking, seminars, self-study, taking exams and so on.
2. Skills that help you conceptualise or analyse materials, or help you carry out tasks that are expected of you: writing essays and reports, weighing up evidence, critically reflecting on your work.

In short, the first of these categories is concerned with maximising learning, and the second with moving towards thinking and acting as a psychologist. The next main section of the chapter (under the subheading 'Applying your study skills') focuses on some of these skills in more detail.

In this section we introduce some of the underlying principles that are particularly pertinent to the study skills in the first category: enhancing understanding and learning.

Table 41.1 lists five principles relevant to skills of understanding and learning, together with a number of recommendations or aspects. Each of the principles is considered in detail below.

Principle 1: stay relevant

It is perhaps a truism to say that learning is likely to be most effective if you stay focused on the materials or skills to be mastered, and that the longer you focus on the task, the more you'll learn. However, it's not always obvious either what is most relevant or how to stay on-task. Is repeating material over and over again effective? Should I have a heroic four-hour revision session without a break or would I be better advised to space things out a bit? Should I focus on a single activity or jump between a number of different activities?

We'll give the practical advice first.

- In general, when studying do whatever is necessary to maintain your interest and attention.

- For simple factual learning, the amount of time spent studying is generally what matters; with more complicated material the focus should be on understanding.
- Have breaks: spacing out your practice really does help, and particularly when you feel your concentration waning.
- Alternate between different topics and activities (such as switching between reading and writing assignments), but make sure you do so in such a way that the two topics don't get confused.
- Vary your study methods. For example, intersperse studying on your own with working collaboratively (discuss your ideas with a colleague, get a friend to test your knowledge).

So what principles underlie this advice? Certainly one of the oldest and most robust findings in memory research is that in learning *simple* material, the best predictor of how much and how well a person learns is simply how long they spend on the task, more or less regardless of how they go about memorising the material. This is known as the *total time hypothesis*, and was first investigated in the 1870s by a German philosopher, Hermann Ebbinghaus. It has been explored extensively since, not only in the lab with meaningless materials, but also in the classroom (e.g. Bloom, 1974). However, the more *complex* the material to be memorised, the more important the nature of *how* you study activities becomes – total time of study is still important, but so too is doing the right sort of study.

How the total study time is distributed is also important for the learning of material: for a given amount of study time, memorisation will generally be more effective if the study periods are spaced out rather than grouped together. Initial observation of this phenomenon is again attributed to Ebbinghaus, and it has been investigated and put to practical use ever since. Not only is immediate memory improved by *distributed practice* (as the technique is known), but so also is longer-term retention (e.g. Baddeley and Longman, 1978). So when learning material, avoid the four-hour slog – it might be better to break your learning into, say, half-hour or 45-minute sessions. Longer breaks that involve a day off or returning to study a month later have also been shown to improve the long-term memory of subject material (Rohrer and Pashler, 2007).

This effect may in part be due to the boredom and sagging attention of long sessions, but also seems to be related to the advantage of encoding materials in a wider variety of situations (a phenomenon known as *encoding variability*; Maki and Hasher, 1975). This idea – that learning under a range of conditions strengthens subsequent recall – is behind the suggestion for alternating activities or varying study methods.

Relevance also depends on your personal goals and perspectives. Surveys exploring the motivations of psychology students (e.g. Newstead and Hoskins, 1999) demonstrate that most tend to be *extrinsically* motivated (that is, motivated by factors external to the focus of study, such as by the need to get a good degree or obtain useful skills to get a job), but some are primarily motivated by *intrinsic* interest in the subject. So think about the following questions.

- What motivates you?
- Are your motivations different for different parts of the course?

If you are primarily concerned to get a good degree and high marks in your assessments it may make sense to focus your study strategically on what you reckon to be most effective to meet this goal. Don't forget, though, that a broad interest early on might pay dividends in assessment later in the course – that topic you ignored in the first year because it seemed a bit boring at the time may be crucial in understanding some more advanced concept in the third-year module.

A related aspect of relevance relates to your personal enthusiasm and interests in the subject. Naturally it makes sense to pursue those topics you find the most compelling and motivating, but of course it is unwise to do so to an extent that damages attaining your overall goals. It is up to you to be strategic in finding the appropriate balance.

A final aspect of relevance relates to your individual *learning styles* and preferences: these are covered in the section below entitled 'Playing to your strengths'.

Principle 2: maximise meaning

Two friends are watching the football results on the television. A little later they go to the pub and get into conversation with the barman about the Premier Division rankings. One of the friends has total recall of the match scores and the goal scorers, the other has virtually no idea of who has played whom, let alone the scorelines. Why should this be? They both heard the same information, and both seem to have equally good memories over other day-to-day events.

This is a common enough situation, and the explanation is equally straightforward in everyday terms: the first is an avid football fan, and already knows a great deal of information about the teams and their current form; the second has no interest in and little knowledge of football. It is an awful lot easier to learn new information when it ties in with a rich set of existing knowledge than when it makes little connection with what we already know. In fact, the term 'learn' seems almost inappropriate for our football enthusiast; the new knowledge about match results and who scored the goals seems to be retained with no effort at all.

This phenomenon is the basis for perhaps the most powerful of the study skill principles: try to make sense of things and find ways of relating them to your existing knowledge. Learning of conceptual material occurs as a by-product of understanding it; learning is not an optional activity that can be switched on or off independently of comprehension. This general principle has a number of implications for study. For example:

- capitalise on what you know already – for example, by linking concepts to personal experiences or concrete examples that make sense to you
- try to form analogies or parallels based on familiar situations, to make concepts seem less abstract
- search actively for links with information you have learnt in other course modules
- share with others to help you reformulate your own ideas and gain from other people's perspectives.

A different implication of the importance of linking new knowledge to existing knowledge is that it can be effective to develop 'ways of remembering' that will help you encode new information and retrieve it later, even if this requires some extra effort early on. A simple example is the use of mnemonic tricks: imagining items placed along a familiar route, or linking a list of items to a mnemonic rhyme ('One is a bun, two is a shoe', etc.), or using first letters of words to be remembered to make up a memorable sentence. These are examples of *retrieval schemata* – structures to which you can link new knowledge in a distinctive or meaningful way, which will assist later retrieval.

While such techniques are perhaps most powerful when dealing with relatively simple factual material, they should not be underestimated when remembering 'prompts' for more complex material. For example, suppose in an exam you are faced with the question 'Critically evaluate two theories of selective attention in accounting for relevant experimental evidence'. If, in your revision, you have encoded the 'headings' for the main strengths and weaknesses of different theories using some mnemonic, you are less likely to forget some crucial point under the stress of exam conditions as you have a systematic way of retrieving the key information.

The power of retrieval schemata is illustrated in a classic study, where one heroic participant increased his digit span (the number of random digits one can correctly repeat back after a single presentation) to over 80 items after many hours of training. This subject based his encoding and retrieval on a structure of times for athletic events (Chase and Ericsson, 1982). In another study, a waiter was able to memorise complete dinner orders from tables of up to eight guests by using a system of first-letter mnemonics (Ericsson and Polson, 1988).

An interesting feature of both studies is that, following a complete session (an hour's testing in the digit span study, an evening shift for the waiter), the participants were able to recall nearly all of the material from the entire session.

A final implication for study is to try to elaborate the *meaning* of the material you are studying.

- Think about the study materials from different perspectives. For example, how they might be applied in different situations.
- Look for comparisons or contrasts that emphasise or bring out particular aspects or highlight differences.
- Try reworking a description or a concept into different words.

These recommendations tie in to a couple of well-established principles from memory research: *depth of processing*, whereby information that is processed more deeply (elaborated) is remembered better, and *encoding specificity*, whereby material that is encoded to be distinctive from other knowledge can more easily be retrieved (provided you are able to use the distinctive cues when you are trying to recall the information). *Elaboration* has been shown to be a much more effective strategy for learning than rote practice, and particularly for longer-term retention. It is especially effective with more complex materials.

Principle 3: be active

Doing things with the material you are learning rather than merely studying it tends to result in better learning (see the following examples).

- Don't just read through the material for an essay-based exam: practise writing answers under exam conditions. Practising writing essay plans will help too.
- Try representing some topic in a different way from how it's presented in the textbook or lecture, perhaps as a diagram (such as a concept map or spider diagram) or as a poster.
- Where practical, try out phenomena or techniques for yourself: see whether visual illusions really work with your non-psychologist friends, or whether the Stroop effect works in French. Be imaginative!

Why does this help? First of all, there are a number of memory effects which suggest that action results in better learning. One is the *enactment effect* (Cohen, 1984) where, for example, if one group is asked to remember the descriptions of simple actions (such as breaking a match) and a second group actually carries out the actions, subsequent recall is higher for the second group.

A related phenomenon is known as the *generation effect* (Gardiner, 1989). This refers to the fact that people tend to be better at remembering material that they have generated for themselves than equivalent material provided by someone else.

A deeper explanation comes from the distinction between *declarative knowledge* and *procedural knowledge*, and how reliance on procedural knowledge tends to increase as a person becomes more expert at a skill. Declarative knowledge concerns facts and concepts, things that can be explicitly expressed or 'declared' – usually in words. Examples include knowing who the prime minister is or how many legs a spider has. Procedural knowledge, on the other hand, is knowledge of actions and how to do things: tying a shoelace, walking, riding a bicycle, playing the piano. Once procedural knowledge is acquired, it is expressed implicitly, through performance or action, and indeed experts may have little awareness of or access to the underlying knowledge that drives performance.

You may feel that not much of the knowledge you learn in a psychology course is procedural in nature; if so, you'd be quite wrong. The knowledge underlying tasks that you practise a lot, such as structuring an essay or a practical report, is likely to become procedural. In addition, as you become more expert about the concepts and ways of thinking within an area, the learning of new materials itself becomes more proceduralised or automatic. As your course proceeds, you will become more familiar with, for example, the technical language, with the way theories are tested, with the way research papers are structured, with how statistical tests are chosen and carried out. The greater this familiarity becomes, the easier it is to make sense of the next specific example.

The downside is that, even if the expert version of a skill is based on procedural knowledge, the learner has to pass through a painful stage of using declarative knowledge in order the learn the new skill, and this may require a good deal of explicit planning and effective use of feedback. (Learning to drive a car is a typical example.) So we have some more recommendations, as follows.

- If a new topic or activity seems really difficult, don't panic! New things are hard. Remember those early days of learning to ride a bike, swim or drive a car? The same can be true for new topics.
- Get feedback on how you are doing. Comments from a critical friend or your tutor may well help.
- Keep looking for meaning, trying different perspectives, elaborating and collaborating, and the topic will start to make more sense.

The idea that many of the activities involved in your course involve calling on a mix of procedural and declarative knowledge brings us back to the recommendations at the start of this section: learn by doing. If writing essays or answering multiple-choice questions involves procedural knowledge (which it does), then you will get better at these tasks by doing them, or components of them, over and over again. After all, you wouldn't get very far learning to ride a bike just by thinking about it.

However it may not be practical, and it will certainly not be enjoyable, to spend your time writing hundreds of essays. Instead, it's helpful and more efficient to identify what the 'task components' are that would benefit most from practice. One of the answers in the study of psychology is likely to be 'critical thinking' skills. For example, when considering an essay or other assignment:

- think actively about, talk about and make notes about topics and ideas in a critical and open-minded way
- evaluate whether the evidence is really as good as it is claimed to be, and what other evidence might support, counter or have implications for the topic in question
- consider alternative explanations or theories, and whether or not 'common-sense' explanations accord with more formal explanations.

Remember that getting into the habit of asking critical questions will in itself become a skill.

Principle 4: be reflective

This principle concerns three related aspects of study: reflecting about what and how you are studying, reflecting about your plans and how you are getting on (for example, your *learning goals*, achievements and progress), and reflecting with others on both of these. In current educational parlance, the term *reflective practice* is often taken to mean only the middle of these – reflecting on personal plans, goals and their achievement – but we will consider a wider view of reflection in order to be more helpful.

Reflection about content is partly a matter of critical thinking, as mentioned above. But it is also important to take a step back and think about issues such as the following.

- How do the different aspects of the module (content, activities) interrelate, and how do different modules relate to each other within the programme as a whole?
- What bits of the module do I understand and what am I confused (or just plain ignorant) about? What do I need to work on and how should I go about it?
- What preparatory work should I do before a teaching session?

ACTIVITY BOX 1

Reflective checklist for graduate skills

Use Table 41.2 to reflect on the skills you hope to acquire during your course. You may wish to add to or modify the list. This is a reflective checklist that might be helpful in considering the extent to which you are achieving the graduate skills you hope to gain from your psychology degree programme. Employers will be less interested in the specifics of your knowledge (even if your experimental project has made you a world expert on some interesting wrinkle on the pseudohomophone effect) but rather more interested in what skills you have in being articulate, reflective or analytical, in showing an ability to learn, to negotiate or to work with others.

For each skill listed in the box, note your current skill level, what evidence you could provide to convince a potential employer and what more you might do to enhance or make evident your skill.

TABLE 41.2 SKILLS I HOPE TO ACQUIRE DURING THE COURSE

Skill and subskills	My current level 1 = low, 4 = high	Evidence for my skill level. What could I put on my CV or say at a job interview?	Plans and comments. Where do I want to be? How do I get there?
Numeracy • Understand and use graphs and tables • Work with descriptive statistics • Carry out and understand a range of statistical analyses			
Writing skills • Use correct grammar and spelling • Be able to put my own ideas into words • Organise ideas coherently • Write a clear and well-organised report • Summarise information from different sources			
Information skills • Use e-mail • Find relevant information (on web or in library) • Evaluate web resources • Word-processing • Spreadsheets and databases • Statistical analysis			
Teamworking • Contributing to a group discussion • Speaking in a group without dominating • Listening carefully to others and being open to ideas • Negotiating and compromising • Putting points across tactfully • Summarising a discussion			
Communication and presentation • Put ideas across succinctly and clearly • Prepare and give a presentation to a group • Know when to use diagrams • Prepare a poster • Answer questions			
Time management and organisation • Able to meet deadlines such as handing in coursework • Plan and allocate my time on a complex task • Prioritise tasks • Juggle competing demands • Organise a busy schedule			
Analysis and problem-solving • Identify the key issues that are a problem • Marshal relevant facts • Clearly outline the available options • Consider alternative solutions in a balanced manner			

- How should I plan my revision in the three days left before the exam?
- What study techniques might it be useful to apply to some part of the course?

You can no doubt add to this list. The point is that a little reflection and planning will help build a feeling of responsibility for your own work, help you use your time effectively, reduce anxiety and worries, and even perhaps avoid an unforeseen catastrophe.

The second form of reflection relates to your personal plans and goals, how they develop and the extent to which you feel you are achieving them. It may well be that your course includes some form of *personal development planning (PDP)*, perhaps directed towards skills for employability, and this may provide a helpful framework for reflection.

You will have plans and goals at different levels, from a long-term view of your degree, future education or employment, down to how on earth you can survive the next week. It can be all too easy for the short-term pressures – the looming deadlines and the tendency to procrastinate until the last possible moment – to dominate, and for little explicit thought to be given either to longer-term issues or indeed to reflecting on your current work and skills.

There are many handbooks and guides that provide checklists and forms to aid personal reflection. For example, Collins and Kneale (2001) and Freeman and Stone (2006) are written particularly for psychology students.

Is the kind of PDP activity in Activity Box 41.1 worth the effort? A thorough systematic review of the effects of PDP on learning in higher education (Gough, Kiwan, Sutcliffe, Simpson and Houghton, 2003) concluded that 'the processes and actions that underlie PDP do have a positive impact on student attainment and approaches to learning'. However, the authors add that 'there is also not sufficient evidence to state which balance of the many PDP approaches is more or less effective in impacting on student learning'.

So while you can have some confidence that some sorts of PDP will help you, you would be wise not to adopt these approaches blindly, but rather (as with many other aspects of learning) take responsibility yourself in deciding just what approach to adopt and how best to use it.

The third form of reflection is to share thoughts and feelings with others. Although a good deal of study at university is necessarily an individual activity, much informal working, and some formal sessions, are collaborative. The tradition of students interacting to learn stems from the Ancient Greeks, the so-called *Socratic dialogue* method, with emphasis upon the student working with an expert. This approach, where the guidance of an expert helps the student to move into less familiar territory, forms the basis for the tradition of education and research that has blossomed from the work of Vygotsky (1962).

However, this 'master–apprentice' model is somewhat diluted in university teaching nowadays, with much larger groups and often student-led sessions. All is not lost, though: research does suggest that student-based groups can be effective in terms of motivation and achievement. Such approaches put a greater onus on the student to contribute and collaborate. Issues in group-based teaching and learning are reviewed by Bennett, Howe and Trusswell (2002).

Regarding informal collaboration, students are sometimes unduly concerned that collaboration will be seen as a form of cheating or 'unfair', as assessment focuses on the individual. While much assessed work should of course reflect individual effort and knowledge, many aspects of study can profit from collaborative work or discussion. Some departments encourage collaborative work through group problem-based learning or enquiry-based activities; many allow group final-year projects.

All courses will include collaborative discussion of one form or another. Informal discussion concerning the sorts of issues listed earlier in this section is likely to be helpful. For example, sharing aspirations, worries, achievements and evaluations with others. Not only will friends and colleagues help you formulate and develop plans and ideas, discussion with others acts as a reality check on expectations and progress.

More specific advice on making the best of group learning situations is given in the section entitled 'Working in groups', below.

Principle 5: play to your strengths

People differ. This is as true for approaches to learning as it is for other aspects of life. However, by the time a person has reached higher education, it is likely that he or she will be a fairly flexible learner, able to adapt learning activities to the demands of the situation. This doesn't mean that individual preferences are not important; they are and they can have a major influence on *learning outcomes*. Nevertheless, it is generally more productive to think of different learning styles as a matter of preference and strategic choice rather than as unchanging personal attributes. After all, we have evolved to perceive and learn about complex abstractions from a rich and varied environment. That environment is not going to present itself differently to individuals who prefer a serialist to a holist style of learning, say. We have to adjust our learning style to suit the external conditions.

A study conducted on psychology students makes the point rather well (Newstead and Findlay, 1997, reported in Newstead, 2002). The students were tested to ascertain the extent to which they were adopting a deep or surface approach to their studies on a weekly basis during the lead-up to a formal exam. (A *deep approach to learning* favours an emphasis on understanding and elaboration; a surface approach concentrates on learning the facts in more of a rote fashion.)

Fifteen weeks before the exam a deep approach was favoured, but as the exam got closer the prevalence of a surface approach to study steadily increased. The results are shown in Figure 41.1. An explanation is probably that students perceived a sensible strategic approach was to

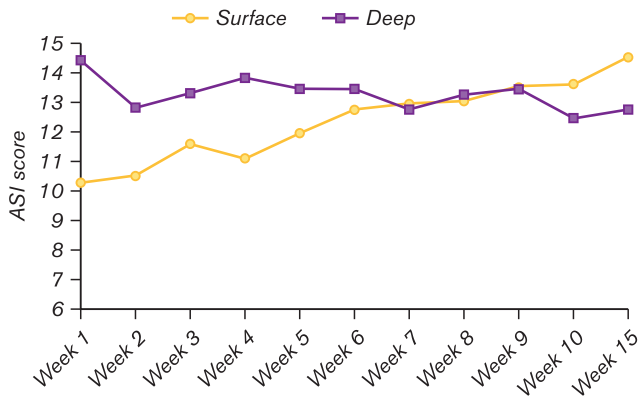


Figure 41.1 Changes in students' approaches to studying in the lead-up to an examination: scores are measured on the sheet form of the approaches to studying inventory (ASI)
Source: adapted from Newstead, 2002

'cram' for this exam as the deadline approached. Of course, the most effective strategy will depend on the sort of exam, and your state of knowledge and understanding beforehand. The point here is that the students were able to change their learning styles in a strategic fashion depending on their perception of the demands of the situation.

This example has probably raised a number of questions for you. What are the important dimensions of individual difference in learning? How can I tell what my preferences are? When should I adopt one style rather than another? These are valid and sensible questions, but are quite hard to answer because there are so many claimed 'learning styles'.

One aspect of individual difference relates to the working environment. People differ in when and under what conditions they work effectively. For example, some people are much more effective working in the morning, some are better late at night. You probably have some feel for this already. If so, adjust your working habits to suit your preferences whenever it is practical to do so. Likewise, some people are much more tolerant of noise or interruption than others – so, again, try to adjust your working environment to suit your preferences.

There are many models of learning style, and even more of cognitive style, which also influence learning. A couple of examples of learning styles will illustrate the flavour of this area. One popular model of learning style has been proposed by Honey and Mumford (1992), who identified four main learning style preferences: activist, reflector, theorist and pragmatist. Table 41.3 summarises some of the key differences between these four types of learning style.

A second, and rather different, categorisation is provided by Sternberg et al. (2000), based on Sternberg's conception of human intelligence, in which individuals vary in their analytical, creative and practical abilities. This distinction is taken up later in this chapter, in the section on 'Assessment'.

We can offer a number of recommendations, as follows.

- Identify aspects of your learning preferences, both in terms of situations (time of day, the sort of environment) and in terms of learning styles.
- Adjust your working habits to suit your learning preferences, and look for ways of playing to your strengths in terms of your learning styles. If, for example, there are choices for some assessed coursework, it may be that one particular question suits your style.
- Bear in mind that you also need to adapt your style to the situation. Be a flexible learner!

Applying your study skills

Being aware of the cognitive processes and different strategies that facilitate learning gives you the ability to consider and monitor your own progress. It enables you to question what you already know, what you need to know, what strategies you should use and what corrective action to take if things are not going well. Psychologists refer to this ability as *metacognition*. In this section, we will focus on how you can use this 'metaknowledge' to optimise your opportunities for learning in different situations, such as lectures, *small-group work* and assessment.

Lectures and note-taking

How you apply your study skills in different situations is the responsibility of both the course staff and yourself. Staff design the teaching and learning activities that you, the student, will engage in. This still leaves plenty of room for variability between staff performance and student performance! For example, we all know that some *lectures* can be dull. Perhaps you have already experienced being in a large, over-crowded lecture theatre with a lecturer presenting one overhead after another in rapid succession. In contrast, you may have sat spellbound through a lecture in the same overcrowded lecture theatre feeling entertained by a lecturer telling a good story about some aspect of psychology you are interested in.

Use your psychological knowledge to get the most out of both situations. For example, in both cases it would be well to remind yourself that being a passive listener is not the most effective route to learning.

There is some debate among university staff as to whether students should be given handouts of lecture notes prior to lectures. There is a concern that students will not bother to attend the lecture if they already have the notes. However, it is increasingly common for some information to be provided either on the departmental website or handed out prior to the lecture. You can use handouts to highlight areas you do not understand, or to note ideas you have for asking questions, or to jot down a link to something that you have learned previously.

Some students claim that note-taking helps them remember, sustains their attention, provides material for

TABLE 41.3 CHARACTERISTICS OF HONEY AND MUMFORD'S FOUR TYPES OF LEARNING STYLE

	Learning style			
	Activist	**Reflector**	**Theorist**	**Pragmatist**
Learn best with:	New experiences and challenges Short 'here and now' tasks Teamwork and problem-solving Excitement and variety High-visibility tasks such as leading discussions	Encouragement to watch, think or ponder on activities Time to think before acting Tasks allowing careful, detailed research Time to review their learning No pressure or tight deadlines	Tasks where what is offered is part of a system, model, concept or theory Exploration of interrelationships between ideas, events and situations Tasks where they are asked to analyse and evaluate, then generalise Tasks where they can question basic assumptions or logic	Tasks with an obvious link between the subject matter and a real-life problem Tasks that involve techniques for doing things with practical advantages Tasks with a model they can emulate, or that allow them to concentrate on practical issues Immediate opportunities to implement what they have learned
Learn poorly when:	Listening to lectures or long explanations Reading, writing or thinking on their own Absorbing and understanding data Following precise instructions to the letter	Acting as leader or role-playing in front of others Doing things with no time to prepare Being thrown in at the deep end Being rushed or worried by deadlines	They have to participate in situations that emphasise emotion and feelings The activity is unstructured or briefing is poor They have to do things without knowing the principles or concepts involved They feel they're out of tune with the other participants, e.g. with people of very different learning styles	There is no obvious or immediate benefit that they can recognise There is no practice or guidelines on how to do it There is no apparent payback to the learning, e.g. shorter meetings The event or learning is 'all theory'

reflection and revision, and identifies areas they are unsure about. There is psychological evidence to support this. Earlier in this chapter it was noted that we retain more knowledge if we have encoded it in a variety of ways (for example, through seeing, hearing, thinking, doing). Having notes provides an additional representation of the knowledge; reorganising notes helps you to structure the knowledge in a way that is meaningful for you; rereading and revising your notes reduces the likelihood of you forgetting. Which technique you use is up to you; the important thing is to find ways of being an *active learner*.

If the topic area is difficult, make sure that you have read something about it before the lecture – you will find the language more familiar and it will be easier to identify what it is you are finding difficult. Sometimes lecturers will pause in order to let students reflect on what has been said, or proffer some questions for you to consider either individually or with others sitting near you. Allowing the audience to predict the answer to a question by voting (as in 'ask the audience' in *Who Wants to be a Millionaire?*) is another technique. These are all methods that lecturers use to help students engage with new

FOCUS POINT 41.2

Guidelines for preparing and delivering oral presentations

Preparing your presentation

- Make sure you understand the purpose of the presentation. Will the presentation be assessed? What criteria will be used to assess the presentation (for example, skills of oral presentation, knowledge of research, both)?
- Work out an appropriate structure for the presentation. Getting off to a good start helps to calm the nerves, so start with something easy such as a short introduction that gives the title of your presentation and a description of what you are going to talk about.
- As in an essay, try to ensure that your talk has a beginning, a middle and an end, with a logical progression through the points you wish to make. Make sure you use your own words rather than jargon or technical phrases that you do not feel comfortable with or fully understand.
- Visual aids such as overhead slides or PowerPoint® can be useful or distracting. Keep them simple and use a large font (24+). Animation and sound effects tend to distract attention.
- Overheads and PowerPoint are effective for: outlining the structure of your presentation to your audience; displaying diagrams, tables or statistical information; summarising your talk and posing questions for discussion.
- Practise your talk in a situation as close to the real one as you can. Talking out loud will help you to check the timing and to identify ideas which you find difficult to articulate or don't flow.
- Novice presenters usually pack too much into presentations. Keep the detail in your own notes, not on the overheads or PowerPoint presentation.

Giving the presentation

- Speak clearly and try not to read directly from notes. Expand on rather than repeat what is written on the overheads or PowerPoint presentation.
- Try to engage the audience with a smile or eye contact.
- If it is a group presentation, try to hand over to the next speaker in a way that keeps the presentation flowing.
- Try not to mumble, talk in a monotone, or talk too fast. Taking a sip from a glass of water can be a useful way to stop, relax and start off again.
- If you are running out of time, omit some of the detail rather than speaking faster or not getting to the end.
- Finish your talk with a flourish. This could include displaying a couple of questions for discussion.
- Invite questions after your presentation. These may lead to discussions within the group that will further your understanding.

material – in other words, to take an *active approach* to their learning.

Lecturers are aware that students may feel shy about asking questions – particularly in front of a large group of their peers. One method that some lecturers use is to ask students to note down things they found unclear, and then to provide a box for queries or comments that students can use as they leave the lecture hall. Reading through these can help the lecturer identify points that were unclear during the lecture and allow them to be revisited, maybe at the beginning of the next lecture or in a subsequent seminar. In some departments lectures are made available as podcasts and this presents an additional opportunity to come back to the material and identify areas that you are not sure about.

If you are still worried that you have not understood something, it can be helpful to discuss it with other people who were at the lecture, to read around the subject again or to contact the lecturer to seek clarification. It's good to talk! This is another thing we know about learning: trying to articulate our thoughts can be a powerful way of realising what it is that is proving difficult to understand.

Working in groups

During your course there will be opportunities to work with other students in smaller groups, such as in seminars, tutorials and practicals. The psychology of groups is well researched and course staff have some responsibility to apply this knowledge when setting up group work. The size, degree of familiarity, the nature of the tasks, and the way these tasks are assessed affect the performance of the group (McKenna, 2000).

The activities that students are required to engage in during seminars, tutorials or student-only groups will vary according to the intended learning outcomes for the module. They provide opportunities for students to explore lecture topics in more detail through discussion, reasoning and problem-solving in order to develop *critical thinking skills*. In tutor-led sessions, there is a tendency for students to avoid eye contact with the tutor in case they get asked a 'difficult' question. Indeed some tutors find the long silences after a question has been posed as awkward as the students and will end up answering the question themselves or, worse, avoid asking 'difficult' questions at all. Remember that we learn by making sense out of nonsense or, more formally, as Piaget described it, through the processes of assimilation and accommodation. Again, it can be difficult to articulate what it is that you do not understand, but the very process of trying will help to clarify the problem. Indeed, students who contribute in small-group sessions tend to perform better than those who don't. More generally, a National Institute for Science Education study (Springer et al., 1997) showed that students who learned in small groups demonstrated greater achievement, persisted to a greater extent through their courses and expressed more favourable attitudes towards their courses than students who did not work collaboratively or cooperatively.

In other cases, there may be a focus on developing your *oral and communication skills* through student presentations, debates or role-play. Again, this can be an anxious time for students, but try to remember that it is normal to be apprehensive about speaking in public and, more often than not, it becomes less scary with practice. Being well prepared and practising your presentation beforehand (preferably aloud in front of a mirror) are good ways of coping.

Focus point 41.2 offers some guidelines to help with the preparation and delivery of oral presentations.

Small-group sessions also provide a valuable opportunity to try out your new-found knowledge on others. Perhaps during the week you have made a tentative link between your own life experience and what you have been studying, or wondered whether there is any connection between the psychological concept under study and something you have observed or learned about elsewhere. By raising these new constructions of your understanding in the group you may be reinforcing your own understanding, and you may receive valuable feedback that will enable you to adjust your understanding and help others to make valuable connections themselves.

Seminars and tutorials are often led by a postgraduate, who will have received guidance from the lecturer on organising the work to be covered. The postgraduate may approach the material from a different perspective or even disagree with the lecturer's viewpoint. This is normal behaviour among academics! It is important to understand that there are few 'right' answers in psychology. Aspects of mental health, for example, can be analysed from a medical illness viewpoint or from a societal perspective. Evidence can be provided to support both views. Understanding that there may be *different perspectives* on topics is in itself a valuable skill.

Courses will contain a mixture of individual and group activities. Studies have shown that problem-solving and critical thinking can be improved by working in groups. There is growing interest in the use of enquiry-based methods of learning to support these skills. In these situations the responsibility for investigating a defined area is passed across to the student group with the lecturer in a support role.

In practice, students often report problems working on team or group projects. There can be concern that not all members pulled their weight, which may well be true, and fear that as a result their own assessed mark may be affected. In these situations it is important to agree some ground rules early on within your group. Use your *personal skills* to get to know others in the group, find out what their constraints are, which methods of communication will work best for them (for example, face to face or over the internet) and agree deadlines in advance.

Focus point 41.3 provides a checklist of good practice when working in groups. Remember, learning to work with others, reaching compromises, understanding differences, sharing workloads, solving problems – these are the kind of *group skills* that employers are looking for.

FOCUS POINT 41.3

Checklist of good practice for working in groups

1. Make the best use of each person's special skills.
2. Try to work in a collaborative rather than competitive way.
3. Share your ideas with others in the group.
4. Show others respect, even if you disagree with them.
5. Listen to another group member when that person is speaking.
6. Encourage others to speak.
7. Stay on the group's task.
8. Help the group to stay on-task.
9. Do not allow yourself to be distracted.
10. Allow others to present their ideas, even when you think you know the answers.

Writing essays

Many students feel unsure of what is required of them when they are asked to write an *essay*. In brief, essays are used to assess your depth of knowledge, to provide evidence of critical thinking and to show off your creative ideas.

In this section we offer some practical advice for writing essays.

Plan ahead

Once you know when you are required to submit an essay, work out how long you will need to prepare and write the essay, and set aside this time in your work and social calendar. The time taken will depend on the complexity of the essay topic; the preparation time needed may easily take as long as the writing itself. Gather together as much of the reading material and references as soon as you can. If you leave this until you are ready to start work on your essay you may well find that the resources are not available because they are being used by other students. Photocopying material is one solution, although it can be expensive and sometimes it is hard to know at the outset what will be the most relevant material for your essay.

Planning an essay

To begin with, it is best to read overview material that sets the essay topic in context and then to consider the essay title more closely. It should be easy enough to identify what the topic of the essay is, but in addition the essay title will tell you what to focus on and the kind of arguments you are expected to put forward.

Some hints on understanding essay titles are given in Focus point 41.4.

Deconstructing the essay title after preliminary broad reading will enable you to plan the basic structure of the essay. Remember that an essay is not the place to list all the facts you know about the essay topic. The essay should follow a theme and flow, as if telling a story, with one paragraph leading on to the next.

Your next task is to decide on the specific issues you wish to discuss and to consider how you wish to present these issues in the main body of the essay. This will require more focused reading. Highlighting short sections of reading material *that you own* (to deface books or articles that do not belong to you is unacceptable) can be useful as a reminder of where to find key points. This should not replace the active learning technique of making a brief note in your own words about why the key point is relevant to your essay.

Use spider diagrams and notes to summarise points, and to raise questions that you want to discuss or ideas that you want to develop as you read. Remember to note down the references that you have used as you take notes – this will make the job of referencing much easier.

Writing the essay

The key fact here is that essays have a beginning (the introduction), a middle and an end (the conclusion).

The introduction to the essay is where you set the scene for what comes next. It is the place to give a succinct description of the topic area and why the essay question is worthy of discussion, followed by a guide (or route map) to the arguments you will be presenting in the main body of the essay.

The main body of the essay will be a series of paragraphs centred on concepts or issues. Typically the paragraphs will provide a description of the issue, an example supported by evidence, a statement of why the example is relevant to your essay, followed by any counter-examples or critique that weaken the impact of this point. This provides you with the link to your next point, where you repeat this process, and so you continue until you have discussed all the issues you had put down in your plan.

Finally, use the concluding paragraph to summarise what you have discussed and to return to the theme of the essay by providing your considered response to the essay title.

At the end of the essay you should include a list of all references you have cited in the text ordered alphabetically according to the authors' names. Focus point 41.5 shows examples of how to reference a journal article, a book, a chapter from a book and a reference taken from the internet.

When the essay is complete, make sure you use a spellchecker (judiciously – they are not foolproof!) and read

FOCUS POINT 41.4

Some hints on understanding essay titles

Discuss 'levels of processing' and 'working memory' theories in relation to memory in humans

This calls for more than a description of each theory. You should provide evidence for and against the theories, give examples of how the theories can be applied to memory tasks and evaluate their importance.

Critically evaluate 'levels of processing' and 'working memory' theories in relation to memory in humans

Note here that the word 'critically' does not necessarily mean a discussion of negative points. A proper critique will put forward positive aspects as well.

Compare and contrast 'levels of processing' and 'working memory' theories as accounts of memory in humans

Avoid structuring your essay in such a way that a discussion of levels of processing is followed by a discussion of working memory with a brief concluding summary. Instead, focus on shared features and discuss these together, followed by features that differentiate them, or try to identify the key concepts that 'levels of processing' and 'working memory' address: for example, the storing and processing of information. Arguments could then be developed around how the different theories account for memory tasks such as mental arithmetic, holding telephone numbers in memory and so on.

FOCUS POINT 41.5

Examples of how to format references

A journal article should be listed and formatted like this:

Baddeley, A. D., Thomson, N. and Buchanan, M. (1975) Word length and the structure of short-term memory. *Journal of Verbal Learning and Verbal Behavior* 14, 575–89.

A book should be listed and formatted like this:

Gathercole, S. and Baddeley, A. D. (1993) *Working Memory and Language: Essays in Cognitive Psychology*. Hove: Psychology Press.

A chapter in an edited book should be listed and formatted like this:

Chou, C. and Bentler, P. M. (1995) Estimates and tests in structural equation modeling. In R. H. Hoyle (ed.), *Structural Equation Modeling: Concepts, Issues, and Applications*. Thousand Oaks: Sage, 37–55.

A reference taken from the internet should be listed and formatted like this:

Muter, P. (2001) The nature of forgetting from short-term memory. Accessed 7 November 2003, at http://cogprints.ecs.soton.ac.uk/archive/00001963/00/cowanmuter.htm.

the essay through. If you have the time, put it to one side for a couple of days and then reread it. Coming back to the essay will allow you to look at it in a more objective way and to check that the structure seems logical and makes sense to the reader. Finally, make sure you have a copy of your essay before you hand it in.

Many departments will make available the criteria used for determining how an essay is assessed, perhaps including how marks are distributed, and this can help you to structure your essay and decide how to distribute your efforts.

An example (from a UK university) is given in Table 41.4. It is a useful exercise to review your completed essays against criteria before handing them in, and assessing for yourself how well you think you have met these requirements. If after having received feedback on your marked essay it is not clear what you should have done differently, then it is important to seek advice. Reading an essay that received a higher grade or looking at a model answer that the lecturer has provided can be helpful.

Writing reports

The purpose of a report is to convey specific research-based information concisely and accurately. In psychology, when describing a quantitative study, you are expected to follow a standard structure as outlined below. If the study is a qualitative or an exploratory study it is not appropriate to include a hypothesis or prediction. Instead, there should be more emphasis on why a particular analytical method was chosen and a detailed analysis section will replace the results section.

This section provides some practical advice to help you organise a report on a quantitative experiment. Reports are a real test of effective communication as they require you to capture why you did the experiment, how you did it, what the results were and what the implications are. This will provide the reader with the rationale for the work and provide full details of an experiment so that it can be replicated. Laboratory reports for writing up experiments take the following format.

Title

The title of the report should be a concise statement of the main topic. In 10 to 15 words you should be able to convey what the experiment is about.

Abstract

The abstract of the report is a brief summary of the content and purpose of the report. It should be short and informative, stating the problem, the method, the results, the findings and the conclusion. It is easiest to write the abstract after you have written the rest of the report.

Introduction

The introduction should give readers a brief overview of the topic that you are studying, followed by a rationale for why you are doing the study. To do this you will need to indicate what other relevant research has been done in this area and how your study will provide added value to understanding the topic under consideration. As in an essay, you should cite previous work – for example, 'Gathercole and Baddeley (2002)', with the full reference given in the references section. Remember to state your hypothesis explicitly and to identify the independent and dependent variables.

Method

This section should be split into different sections to cover the design, participants, apparatus or materials, and procedure. This is where you describe exactly how the study was conducted. It should contain all the details necessary to allow another experimenter to replicate the study and typically falls into the following four sections.

Design

A brief sentence or two here should provide details of the formal design of the experiment. In a quantitative study this will include whether participants performed each condition (repeated measures design) or whether different participants performed separate conditions (independent measures). You should also state what the independent variables (what was manipulated) and dependent variables (what you measured) were.

TABLE 41.4 EXAMPLE ESSAY ASSESSMENT CRITERIA

Class	**Marking guidelines**
First	***An excellent answer, well written, logical and critical, showing appreciation of major points and integration with points that go beyond the basic module material. An outstanding essay will also show originality and flair.***
Good 1st	Could be used as a 'model answer' on the module; contains relevant material that would not have been anticipated on the basis of module content.
Solid 1st	A full, organised account; evidence of extra reading.
Low 1st	Well argued and full account, perhaps missing some relevant (but not critical) material. Showing some evidence of originality, whether in content or presentation of argument.
Upper second	***Comprehensive, well-organised and accurate answer. Evidence both of having understood the issues and of being able to think about them effectively.***
Good 2.1	Well-organised and full description of core material, lacking the originality or organisation that would qualify for a first-class mark.
Solid 2.1	As above, perhaps missing some relevant details.
Low 2.1	Relatively full account of core material, missing a relevant study or some part of the core argument, but showing evidence of appreciation of the core material.
Lower second	***An adequate answer that is mostly accurate, but there may be some errors or omissions. Limited organisation and scope with no real development of argument.***
Good 2.2	Good answer, as far as it goes; perhaps introducing irrelevant material or missing a sufficient amount of core argument not to qualify as a comprehensive answer.
Solid 2.2	Pedestrian account of a selection of the core material.
Low 2.2	As above, with some errors or many irrelevancies.
Third	***Incomplete answer, sparse information, substantial errors or omissions, poorly organised. Perhaps relating to a different aspect of the core topic.***
Good 3rd	Incomplete knowledge of module material.
Solid 3rd	Confused knowledge (with errors) of module material.
Low 3rd	Very confused and incomplete account of relevant material.
Pass	Provides some evidence of (disorganised) knowledge from the module material. Inaccurate with numerous errors and omissions; very poorly organised; irrelevancies; shows little grasp of issues.

TABLE 41.4 CONTINUED

Class	Marking guidelines
Fail	***A very deficient to totally inadequate essay. Serious errors or omissions. May include only personal opinion with no evidence of having read anything or attended the module.***
Marginal fail	One or two relevant ideas.
Clear fail	No real idea.
Zero mark	No answer, no psychological content.

Participants

This subsection should tell the reader who participated in the study. This should include the number of participants, how were they selected for the experiments, whether they were volunteers or paid and how they were assigned to different conditions. You should also give details of their age, sex and any other factor, such as reading age, that is relevant to the experiment.

Apparatus

In this section you should describe all the apparatus and materials used in the experiment. This might include laboratory equipment, software or questionnaires. Include details of any commercial products, including the name plus version or model number.

Procedure

In this section, describe exactly what happened to the participants. This might include instructions they were given, where they were seated, what training they received, what tests or stimulus materials were administered and what data were collected.

Results

In the first part of the results section, provide summary statistics from the data including the mean and standard deviations for each group. Then you should report the results of the statistical tests you used to ascertain whether there were any differences between the conditions. Use clearly labelled tables and graphs to display the results but make sure that the text can be understood in its own right. You should record all the results, not just those that support your hypothesis.

Discussion

This is the section where you relate the findings of your study to previous work mentioned in your introduction. Start with a brief statement of the main results and whether they support your original hypothesis. You can then move on to discussing the implications of your study for other research. Does your study advance knowledge in the research area? Does it provide different results from other studies? This is also the place to consider ways in which your study could have been improved and to suggest ways in which the work could be taken forward.

References

All publications and commercial products cited in the report should be listed in this section.

Avoiding plagiarism

Plagiarism occurs when you present in your written work someone else's words or work as if they were your own. It does not matter whether you do this deliberately or accidentally – it is still plagiarism. Plagiarism is a form of academic dishonesty and disciplinary procedures are taken against staff or students who plagiarise material. Plagiarism includes:

- exact copying of phrases from another source
- copying of phrases from another source with only minor changes of wording
- failing to acknowledge the proper source and not including it in your reference list.

To avoid unintentional plagiarism, it is wise not to write down chunks verbatim out of books or journals. Make notes using your own words and put quotation marks round any extracts or phrases that are not your own, together with the necessary reference information. A useful guided example is shown in Focus point 41.6.

Many universities make use of electronic plagiarism detection systems that can detect whether your written work is similar to other work on the internet. This includes the detection of subtle alterations to online texts, paragraphs from online essay banks, small chunks of online papers and false citations.

FOCUS POINT 41.6

Illustrative examples of plagiarism

Example A

Let's assume that you, a student, write the following sentences.

The distinction between left-hemisphere processing and right-hemisphere processing in the brain is complex. Recent research indicates that infants show patterns of hemispheric specialization for musical processing (Balaban, Anderson and Wisniewski, 1998).

- The first sentence is a general statement. Perhaps it is your opinion after you've read a number of sources on the topic. Therefore, it does not need a citation.
- The second sentence refers to evidence from a paper that you've read. The sentence is written in your words, not copied or paraphrased from the authors. Therefore, as long as you cite the source to show where the information came from, you are not plagiarising.

Example B

If an exact quote is necessary to convey an idea, use quotation marks and give the proper citation, like this:

A recent study of infants' musical abilities found 'hemispheric specialization for different components of auditory perceptual processing' (Balaban, Anderson and Wisniewski, 1998: 45).

Example C (an instance of plagiarism)

Without the quotation marks, the following statements are plagiarised, even though the source is listed.

A recent study of infants' musical abilities found hemispheric specialization for different components of auditory perceptual processing (Balaban, Anderson and Wisniewski, 1998).

A recent study of infants' musical abilities found hemispheric specialization for different components of auditory perceptual processing (Balaban, Anderson and Wisniewski, 1998: 45).

- This is because, in psychology papers, sources of ideas and information are cited even when the writing is in your own words (see Example A). The statements above would be presumed to be in your own words, but they are not – the phrase 'hemispheric specialization for different components of auditory perceptual processing' is from the original article. Thus, these are examples of plagiarism.
- Note that, because you did not use quotation marks, the statement is considered to be plagiarised even if you listed the page number from the source.

Example D (another instance of plagiarism)

The following statement is considered to be plagiarised because it paraphrases the authors' words too closely.

A recent study of infants' musical abilities found that the brain's hemispheres were specialised for various parts of perceptual processing in audition (Balaban, Anderson and Wisniewski, 1998).

- You cannot take phrases or sentences from another source and simply move around words or insert synonyms.

Source: adapted from Professor Maire Balaban, http://www2.eou.edu/psych/mb/plagiarism.html Accessed 7 November 2003.

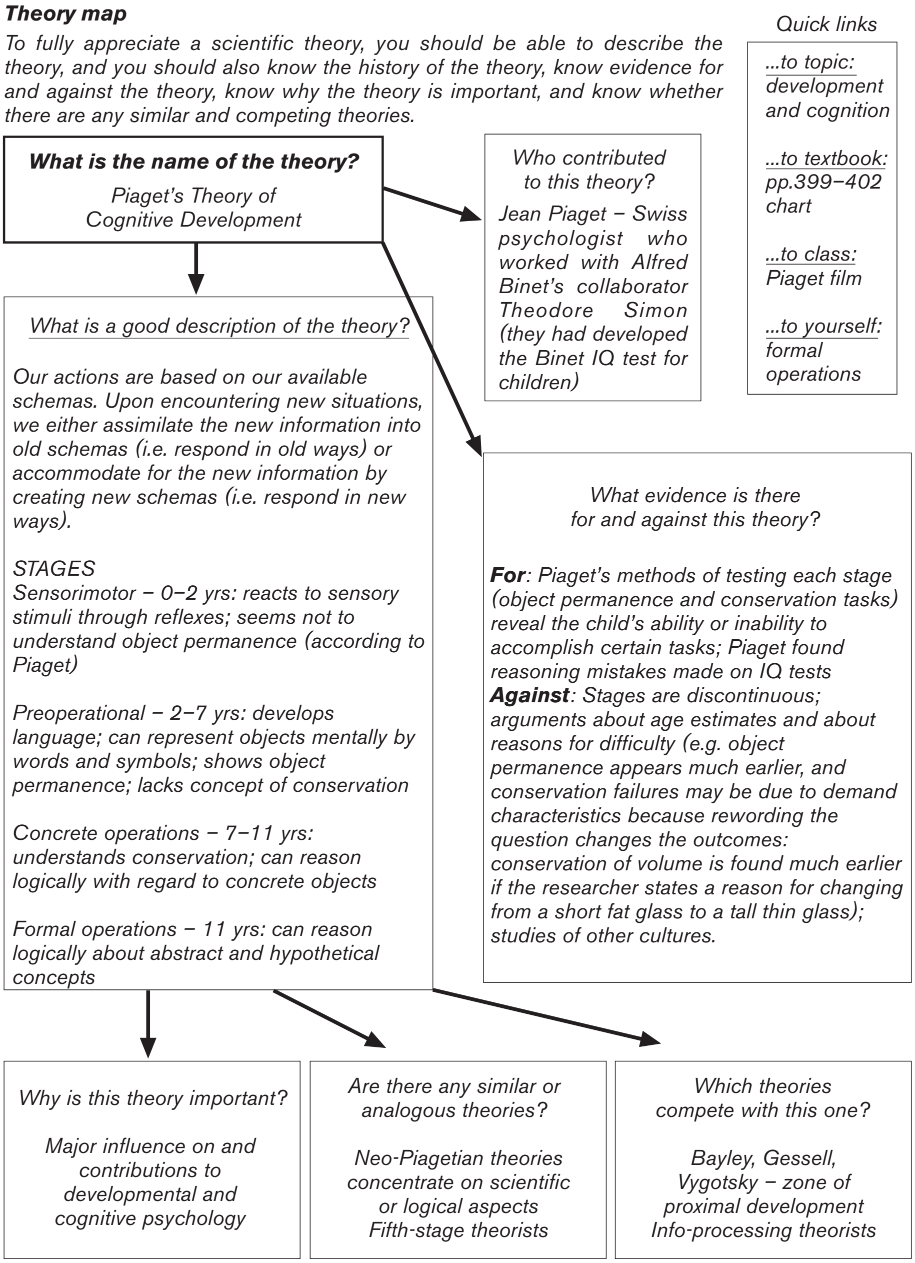
Interestingly, plagiarism has not escaped the interest of cognitive psychologists. Indeed, research has shown that inadvertent plagiarism, or cryptomnesia, is a memory problem that we can see in everyday cognitive functioning. According to Richard Marsh (Marsh et al., 1997), cryptomnesia can occur when the intense concentration required for the creation of new ideas leaves insufficient attention for monitoring the source of the ideas, with the result that old ideas are perceived as new.

Revision

Ideally, revision should be a continuous process throughout the module you are studying. Learning at university should largely be about understanding, analysis, application and expression, not about cramming in facts at the last moment in order to regurgitate them in an exam, with little consequent long-term learning. This ideal is not always reached, and in some areas there is a need to acquire a good deal of basic factual knowledge.

It is inevitable that your style of working and of revision is shaped by your perceptions of the assessment process. So the example we saw earlier of students shifting towards a 'surface' mode of study as an exam approached may have been a sensible one if the exam they were preparing for was mainly testing recall of factual information (however, as it was a third-year exam, typically focused on deep understanding, it may be that some students had a nasty shock).

The point is that you do need to be strategic about your revision. Try to develop a strategy early on in the module



Theory map

To fully appreciate a scientific theory, you should be able to describe the theory, and you should also know the history of the theory, know evidence for and against the theory, know why the theory is important, and know whether there are any similar and competing theories.

What is the name of the theory?

Piaget's Theory of Cognitive Development

Who contributed to this theory?

Jean Piaget – Swiss psychologist who worked with Alfred Binet's collaborator Theodore Simon (they had developed the Binet IQ test for children)

Quick links

...to topic: development and cognition

...to textbook: pp.399–402 chart

...to class: Piaget film

...to yourself: formal operations

What is a good description of the theory?

Our actions are based on our available schemas. Upon encountering new situations, we either assimilate the new information into old schemas (i.e. respond in old ways) or accommodate for the new information by creating new schemas (i.e. respond in new ways).

STAGES

Sensorimotor – 0–2 yrs: reacts to sensory stimuli through reflexes; seems not to understand object permanence (according to Piaget)

Preoperational – 2–7 yrs: develops language; can represent objects mentally by words and symbols; shows object permanence; lacks concept of conservation

Concrete operations – 7–11 yrs: understands conservation; can reason logically with regard to concrete objects

Formal operations – 11 yrs: can reason logically about abstract and hypothetical concepts

What evidence is there for and against this theory?

***For**: Piaget's methods of testing each stage (object permanence and conservation tasks) reveal the child's ability or inability to accomplish certain tasks; Piaget found reasoning mistakes made on IQ tests*
***Against**: Stages are discontinuous; arguments about age estimates and about reasons for difficulty (e.g. object permanence appears much earlier, and conservation failures may be due to demand characteristics because rewording the question changes the outcomes: conservation of volume is found much earlier if the researcher states a reason for changing from a short fat glass to a tall thin glass); studies of other cultures.*

Why is this theory important?

Major influence on and contributions to developmental and cognitive psychology

Are there any similar or analogous theories?

Neo-Piagetian theories concentrate on scientific or logical aspects Fifth-stage theorists

Which theories compete with this one?

Bayley, Gesell, Vygotsky – zone of proximal development Info-processing theorists

Figure 41.2 An example of an academic guide map illustrating understanding of Piaget's theory of cognitive development
Source: adapted from Motes et al., 2003

rather than leaving revision to the last moment. The following pointers may help.

- Identify the goals of the assessment you are facing. Will you be tested on factual knowledge, on your ability to construct an argument, on deep understanding, on your ability to solve problems, or what?
- Take another look at the learning outcomes for the course to remind yourself of what it is you are meant to know. Learning outcomes may be phrased 'by the end of the course students will be able to assess . . ., describe . . ., evaluate . . .'. Take note of the verb that is being used for each outcome; these are purposively written to indicate the level and depth of knowledge required.
- Identify what you think the examiners will be looking for. This might include one or more of: factual accuracy, understanding, relevance, analytical ability, critical thinking, problem-solving, application, creativity, good structure and expression.
- Be clear about the nature of the exam. Look at old exam papers, talk to your lecturers. How much choice will you have? What different approaches are possible? For example, will you be able to focus on your strengths in analytical, creating or practical abilities (see the section

on 'Assessment' below)? Read through and understand any assessment criteria that are provided by your department or module leader.
- Make a list of what you know, what you need to know and where your strengths and weaknesses lie, and use this to decide where you should concentrate your efforts.

Armed with all this information, draw up a plan. This should include the following points.

- Covering course materials, making notes and reviewing your notes.
- Making summaries and overviews. It can be helpful to use a different form of representation from that used in the original learning or in your notes. Some people find spider diagrams or concept maps helpful. A similar technique is termed 'guide maps' (Motes, Bahr, Atha-Weldon and Dansereau, 2003). An example of a guide map is shown in Figure 41.2.
- Practising writing example essays or answers to old exam papers. (Practising writing answer plans will help if you don't have time to do the whole thing.)
- Identifying (and finding ways of practising) where you need to go beyond the course materials (e.g. in applying your knowledge to practical situations, in linking with knowledge from other modules).
- Deciding how to play to your strengths, either in terms of what to cover (but be careful not to restrict your choices too much) or in terms of the types of answer to prepare.
- Setting yourself a timetable. Aim to review all your notes well before the exam.
- Not panicking. Following the above suggestions might help!

Assessment: coursework and exams

Not all students have the skills to write good essays, nor do all students have the skills to do well in exams – although it is to be hoped that these will improve during their course of study. However, are these really the skills that are necessary to succeed in the real world?

Robert Sternberg's research (Sternberg et al., 2000) has included analysing what it takes to succeed in life and has put forward the concept of successful intelligence. He defines this concept as:

> 'the ability to achieve success in life, given one's personal standards, within one's sociocultural context in order to adapt to, shape, and select environments via recognition of and capitalisation on strengths and remediation of or compensation for weaknesses through a balance of analytical, creative, and practical abilities.'

He argues that using the same unvarying assessment methods can result in shining the spotlight on the same students every time. Instead, he advocates the use of a variety of assessment methods so that the spotlight shines, as it were, on different students at different times.

He suggests that assessment should focus on testing memorised knowledge through creative, analytical and practical questioning (known as the CAP model of assessment). Table 41.5 provides illustrative examples suggested by Sternberg for each type of question. As suggested in the earlier sections on playing to your strengths and revision, do your best to identify what you

TABLE 41.5 EXAMPLES FROM ROBERT STERNBERG OF ASSESSMENT QUESTIONS THAT FOCUS ON THE MEMORISING, ANALYTICAL, CREATIVE AND PRACTICAL ABILITIES OF STUDENTS

Memory-based learning (verbs: who, what, where, when, why, how) What is the fundamental attribution error? *A bias of attribution in which an individual tends to over-emphasise internal causes and personal responsibility, and to de-emphasise external causes and situational influences when observing the behaviour of other people.*
Analytical thinking (verbs: analyse, compare and contrast, evaluate, explain, critique) Explain, in terms of the structure of the eye, why we have difficulties in accurately perceiving colours in the dark.
Creative thinking (verbs: create, design, imagine, invent, suppose) Design and describe an experiment to test whether, on average, 12-year-old children from the remote province of Shtungis have entered Piaget's cognitive-developmental stage of formal operations.
Assessing for practical thinking (verbs: use, apply, implement, employ, utilise) Show how you might use the technique of systematic desensitisation to implement a programme to help someone combat test anxiety.

feel you are good at and look for opportunities to capitalise on those strengths.

Strict rules surround what you may and may not do during the examination itself. You should make every effort to familiarise yourself with these in advance. It is a good idea, for example, to:

- know in advance what the procedure is if for some reason you are unable to attend the exam
- check whether you are allowed to have access to a dictionary
- know where and when the examination takes place
- know what you may take (e.g. water) and may not take (e.g. mobile phones, databank watches, coats) into the examination room
- check you have your examination candidate number
- listen carefully to the invigilator's instructions before the exam begins
- contact the invigilator if you feel ill during the exam
- talk to no one other than an invigilator during an examination.

Accessing resources

In this section the focus is on the skills you need in order to access psychological resources for essays, projects and other assignments. Typical activities include accessing journals or books from the library as determined by course reading lists, searching in library or online databases for literature reviews and project work, and searching the internet for information.

Bibliographic databases contain information about journal articles and are an essential tool for finding out what has already been published. They include information on the authors, title and publication, and usually an abstract or short summary. *Web of Knowledge* (http://wok.mimas.ac.uk/) and *PsycInfo* (http://www.apa.org/psycinfo/) are particularly important. It is important that you find out from your university how best to access these and similar sites. Searching for information on the internet can be very useful. However, unrefined searches can result in information overload and, worse, access to misleading and biased information. It is essential that you evaluate carefully information from whatever source. The *Internet Psychologist* (http://www.vts.rdn.ac.uk/tutorial/psychologist/) is a good place to start if you want to find out how to make the best use of the internet while you are studying psychology. It provides a list of key websites for psychology as well as helpful information on how to search effectively and to evaluate critically the material found on websites.

The Intute website (http://www.intute.ac.uk/psychology/) and the Higher Education Academy Psychology Network website (www.psychology.heacademy.ac.uk) are two useful gateways to psychology resources. Both contain links that have been selected for their academic content by psychologists with researchers and students in mind. The Psychology Wiki (http://psychology.wikia.com/) is one of the largest wiki sites on the internet and there are a number of interesting blogs written by psychologists.

Feedback and course evaluation

It is not uncommon for students to feel confused at the end of a module and in some ways to feel less confident of their knowledge than when they began it. This is normal and, believe it or not, can be a sign of learning – perhaps an example of the adage 'ignorance is bliss'. For example, it may be proof that you can make more sensitive observations of behaviour, recognise the complexity of a particular theory or have a better understanding of the competing theories used to explain some behaviour.

At the end of modules you may be required to fill in student evaluation forms. These provide you with an opportunity to reflect on different aspects of the module, such as the content of the course, the way it was taught, the ease of getting hold of resources, and so on. These are a valuable source of information for staff when they come to evaluate how successful the module was and what changes to consider next time the module runs. This means that you, as a student, have a responsibility to provide constructive comments that may benefit the next cohort of students. It is not the place to list problems that could have been addressed early on in the course. For example, 'I couldn't find the books in the library', 'We weren't given enough information about the assessment', 'I couldn't log on to the virtual learning environment' are problems that may have been solvable by seeking out help earlier, before the course ended.

If an occasion arises when there is a strong feeling in the year group that all is not well, the matter can be taken forward by the year's student representative to the appropriate committee. Why not consider standing to become the representative yourself? Remember, if one of your personal goals is to find a good job where communication and negotiation skills are important, this would be a good asset for your CV.

Conclusions

The coverage of study skills for psychologists in this chapter has been partial: we've left out more than we've put in. We've said little about easing the problems of understanding and carrying out statistical procedures, of preparing a poster or conducting a literature review. There are whole books on critical thinking and on how best to critique a research paper; and there's plenty that could be said to help support special groups, such as mature students or those with a disability.

These and other omissions are partly a consequence of space but also of a belief that study skills are not just lists of prescriptions or simply applied guidelines – they are based on an understanding about what principles underlie successful studying. We hope that the chapter has provided you with some understanding of those principles and sufficient examples of their application for you to be able to fill in some of the gaps for yourself.

Learning outcomes

When you have completed this chapter, you should be able to:

1. Describe five key principles underlying study and key aspects of their psychological rationale.
2. Apply the study skill methods described in the chapter to areas of your own study, such as note-taking, writing essays and revision.
3. Reflect on some of the psychological principles underlying study skills and use these to choose study methods for situations not explicitly covered in this chapter.

Further reading

Collins, S. C. and Kneale, P. E. (2001) *Study Skills for Psychology Students*. London: Arnold.
Freeman, R. and Stone, A. (2006) *Study Skills for Psychology: Succeeding in Your Degree*. London: Sage Publications Ltd.
McGhee, P. (2001) *Thinking Psychologically*. Basingstoke: Palgrave.

Glossary

For a glossary of research methods terminology, see page 658.

Aδ fibres fibres which send fast pain messages

abnormal conditions focus model Hilton and Slugoski model of when people are most likely to make attributions. People make attributions when something abnormal or unexpected is perceived

absolute refractory period the interval during which a second action potential absolutely cannot be initiated, no matter how large a stimulus is applied

accessible memories memories which can be accessed and reported, as opposed to memories which may be available but not accessible on a given occasion

accommodation a term used by Piaget to describe the way that cognitive structures or representations (schema) are changed as the result of new experiences and information

achievement motivation envisages that a person has needs for three things, achievement, power and affiliation, but that people differ in the degree to which the various needs influence their behaviour

acquiescence acceptance without protest

acquired dyslexia an impairment in the ability to read caused by brain damage. Different from developmental dyslexia because the person was once able to read

acquired phonological dyslexia an impairment in the ability to read because of an impairment in the ability to convert regularly spelt words to their appropriate pronunciations. The person was once able to read

acquired surface dyslexia an impairment in the ability to read because of an impairment in the ability to access the meanings of irregularly spelt words in the mental lexicon. The person was once able to read

action potential the neural impulses that are involved in communication (sometimes called spikes or when a cell fires)

activational effects when changes in hormone levels influence behaviour

active failures human errors which have their origins in faulty systems of practices

actor-observer differences tendency to attribute our own behaviour to external causes and other people's behaviour to internal causes

adaptation a term used by Piaget to describe the way that behaviour or thinking becomes better suited to a child's environment

ADHD Attention-Deficit Hyperactivity Disorder (ADHD), or Hyperkinetic Disorder as it is officially known in the UK (though ADHD is more commonly used), is generally considered to be a developmental disorder, largely neurological in nature, affecting about 5% of the world's population

adipsia cessation of drinking

adolescent invulnerability a belief held by many adolescents that bad things will not happen to them, which prevents them from adopting healthy behaviours

adoption studies a method for studying the relationship of personality traits and intelligence between biological and non-biological parents to investigate the heritability of these characteristics

adrenocorticotrophic hormone (ACTH) a hormone released from the anterior pituitary, which activates the adrenal gland into releasing corticotrophin-releasing hormone

adult attachment anterview (AAI) an interview developed by Main et al. (1985) to classify adults' relationships with their own parents

aetiology a term mainly used in medical settings to refer to the causes of diseases or pathologies, but also widely used in psychopathology to describe the causes or origins of psychological symptoms

afferent nerves nerves that carry sensory information (see also efferent nerves)

aggression any form of behaviour that is intended to harm oneself, another person or an object

agonists a chemical or a drug that facilitates synaptic activity (see also antagonists, inverse agonist and partial agonist)

alexithymia inability to read one's own emotional state

aldosterone a hormone that retains salt and water and constricts the blood vessels

algorithm in the context of problem solving, a set of rules which, if followed precisely, lead to the correct solution

alleles two genes that control the same characteristic

alpha activity the activity of the brain when inactive and at rest as measured by an EEG

altruism a type of pro-social and helping behaviour in which help is given with no expectation of reward in return

amacrine cells retinal cells that communicate across the retina (see also horizontal cells)

amine hormones a type of hormone (see also protein hormones and steroid hormones)

amnesia a general term denoting temporary or permanent abnormal memory loss

amygdale the part of the limbic system that controls emotion, aggression and the formation of emotional memory. An almond-shaped groups of neurons located deep within the medial temporal lobes

analogy in the context of problem-solving, a strategy which uses the known solution to a similar problem to solve the problem in hand

analytic intelligence the ability to see relations between numbers

androcentrism the view that male behaviour is normal, and that female behaviour compares unfavourably to this norm

angiotensin a hormone, an oligopeptide in the blood that causes vasoconstriction, increased blood pressure and release of aldosterone from the adrenal cortex. Increases thirst and drinking

anorexia nervosa (AN) an eating disorder characterised by a refusal to maintain a minimally reasonable body weight

ANOVA approach another name for Kelley's covariation model and covariation principle

antagonists chemicals or drugs that inhibit neural communication (see also agonist)

anterior nucleus of the thalamus part of the thalamus

anterograde amnesia memory loss for events or information that postdate the event that precipitated the memory loss. See retrograde amnesia for a contrast

antidepressants drugs used to treat the symptoms of depression, such as tricyclic antidepressants and selective serotonin reuptake inhibitors (SSRIs)

antipsychotic drugs drugs used to treat the symptoms of schizophrenia, e.g. chlorpromazine and haloperidol

anti-social personality disorder a psychopathology characterised by a pervasive pattern of disregard for and violation of the rights of others. Impulsive, irresponsible and dishonest behaviour

anxiety a feeling of apprehension or fear, usually resulting from the anticipation of a threatening event or situation. It is often accompanied by various physiological symptoms that may include muscle tension, dry mouth, perspiring, trembling and difficulty swallowing

anxiety disorder when anxiety becomes intense or attached to inappropriate events or situations, it may manifest in symptoms of a diagnosable anxiety disorder (see Chapter 33)

anxiolytic drugs drugs used to treat symptoms of anxiety, e.g. the benzodiazepines (which include the well-known tranquilliser, Valium)

aphagia cessation of eating (see also hyperphagia)

apperceptive agnosia a failure to recognise objects, hypothesised to be due to an impairment in perceptual processes

arbitrariness in the context of the design characteristics of language, the symbols used to communicate (words, written symbols) are arbitrary in that they have no meaningful connection to the meanings they represent. Onomatopoeic words such as 'bang' are the exception

arcuate nucleus region of the hypothalamus

aromatisation conversion of testosterone into estradiol

arousal theory in relation to motivation, that all organisms are motivated to seek to maintain an optimal level of arousal and this optimal level varies from organism to organism

artefacts artefacts are unexpected results arising in an experimental situation as a result of the behaviour of the participant or experimenter, or an interaction between the two

articulation the process of producing a speech sound

assimilation a term used by Piaget to describe the taking in of information by a child

associative agnosia a failure to recognise objects, hypothesised to be due to an impairment in memory for those objects

associative learning a process of learning by which concepts are acquired and which involves the observation and learning of associations between the characteristics of the concept and between the concept and its name

associative network model of semantic memory a model of memory in which concepts, ideas or categories are linked semantically by associations forming a network of concepts. Activating one category will spread to other linked categories

associative stage of skill acquisition the stage in which declarative knowledge becomes procedural by being instantiated as a set of production rules

attachment relationship the way a young child feels about important people in his or her life, and the security he or she derives from this relationship

attention the means of focusing limited mental resources on the information and cognitive processes that are most salient at a given moment (Sternberg)

attentional filter a hypothetical device that filters out unwanted stimulation, thereby permitting a focus on the task in hand

attenuation a hypothetical process in auditory selective attention by which non-target information is still processed but is 'softened' to reduce the resources it requires

attitude a general feeling or evaluation, in a positive (favour) or a negative (disfavour) direction, about a person, object or issue

attraction positive feelings towards another person which may include actively seeking out their presence

attribute model of semantic memory a model in which concepts are defined by their attributes

attribution the process of assigning a cause to one's own or another's behaviour

attribution theory a social-cognitive approach to describing the ways the social perceiver uses information to generate causal explanations. Focused on common sense explanations of behaviour

attribution theory of depression this theory argues that the way in which we attribute causes to our losses and failures could be an important determinant of whether those events will make us depressed

augmentation principle states that the role of a cause in producing an effect is increased if the effect happens in the presence of an inhibitory cause

autism a learning disability first identified by Kanner that involves a triad of impairments (impaired communication, social relations and restricted stereotyped behaviours)

autobiographical episodes (memory for) events which have personal significance for a person

autobiographical knowledge (memory for) one's personal history

autocratic leadership a type of leadership characterised by the persistent giving of orders to other group members

automatic actions in skill acquisition the final stage of skill acquisition, in which a sequence of production rules becomes integrated to form a smooth sequence of actions

automatic processes processes which require little or no attention, are largely non-conscious and can't be stopped

automatic processing processing which requires no attention, is not in conscious awareness and cannot be interrupted

automatic stage of skills acquisition the final stage of skill acquisition, in which the task no longer requires attention, does not require conscious awareness and cannot normally be interrupted

autonomic nervous system the subdivision of the peripheral nervous system that controls the body's involuntary motor responses by connecting the sensory receptors to the central nervous system (CNS) and the CNS to the smooth muscle, cardiac muscle and glands. Maintains homeostasis in the body

autonomous stage of skill acquisition the stage at which a skill develops to the point where it doesn't need thought or even attention

autoreceptors presynaptic receptors that regulate synaptic activity

autosomes a non-sex pair chromosome. Humans have 22 (see also **chromosome**)

availability heuristic a cognitive tool or rule of thumb used to judge how often an event occurs on the basis of how easy it is to bring examples of that event to mind

availability of memories memories which are in the memory store and thus available but which may not necessarily be accessible on a given occasion

axes I-V DSM-IV-TR encourages clinicians to rate individuals on five separate dimensions, or axes. Axes I and II cover the classification of psychopathology. Axes III, IV and V are not usually required to make a psychopathology diagnosis, but are included so that a fuller appreciation of an individual's life situation can be made

axon also called nerve fibre. A long, slender projection of a nerve cell, or neuron, that conducts action potentials away from the neuron's soma

axon hillock the part of a neuron that connects the soma to the axon. It is the place where Inhibitory Postsynaptic Potentials (IPSPs) and Excitatory Postsynaptic Potentials (EPSPs) from numerous synaptic inputs on the dendrites or cell body summate

backpropogation a process in connectionist modelling which involves adjusting the relation between input and output based on feedback about success

balance theory Heider's theory of cognitive consistency in which people strive to maintain consistency among their beliefs and cognitions. People prefer attitudes that are consistent and avoid inconsistent ones

Barnum effect the tendency for people to accept very general or vague characterisations of themselves and take them to be accurate

baroreceptors receptors which detect blood pressure

basal ganglia a group of nuclei in the brain interconnected with the cerebral cortex, thalamus and brainstem. The basal ganglia are associated with a variety of functions motor control, cognition, emotions and learning

base rate information the objective data that may be available when making a probabilistic judgement

Beck's cognitive theory of depression Beck argued that the thinking of depressed individuals was biased towards negative interpretations. In particular, he claimed that depressed people have negative views of themselves, their future and the world

Beck's cognitive therapy a cognitive therapy for depression devised by Aaron Beck which engages the depressed individual in an objective assessment of their beliefs, and requires them to provide evidence for their biased views of the world

behaviour analysis this represents the behaviourist approach to psychopathology where learning theory, and particularly principles of operant conditioning, are applied to the explanation and treatment of psychopathology

behaviour modification a form of behaviour therapy based on the principles of operant reinforcement (e.g. the token economy)

behaviour therapy a form of therapy based on conditioning principles which stresses the need to treat symptoms of psychopathology as bona fide behavioural problems rather than the mere symptoms of some other, hidden underlying cause

behavioural bioassay the use of an animal to mimic or model a physiological mechanism

behavioural genetics the field of biology that studies the role of genetics in behaviour

behavioural pathogens lifestyle factors that represent ways of living, behaving and thinking that give rise to poor health, and are more amenable to psychological interventions than physical or medical interventions (e.g. smoking)

behavioural self-control multi-faceted behavioural programmes that can be used by any individual to control and manage their own behaviour. They are designed to deal with a variety of personal problems which include addiction, habits, obsessions and other behavioural problems

behaviourism an early school of psychology, which is still followed as an approach in some areas of contemporary psychology. Behaviourism considers learning to be a result of the formation of links between stimuli and responses, and rejects the study of mental processes

benzodiazepines a form of drug treatment for anxiety symptoms (e.g. Valium)

beta activity the activity of the brain when active and alert as measured by an EEG

bi-polar depression a form of mood disorder that is characterised by periods of mania that alternate with periods of depression

binding when a neurotransmitter or drug attaches itself to a receptor

binocular convergence the convergence required of the two eyes to focus on an object

binocular cues cues to the distance of an object involving both eyes – binocular convergence and retinal disparity

binocular vision vision in which both eyes are used together

biological preparedness an explanation of specific phobias that claims that we are genetically pre-wired to fear certain phobic stimuli and events

biological reductionism biological reductionism is the belief that we can understand the behaviour of humans by investigating the behaviour of less complex animals. Examples of biological reductionist approaches include behaviourism and sociobiology

biomedical model of health a conceptual model of health that seeks the causes of illness in physical entities such as germs and viruses, and sees the corollaries of illness – such as pain – as being caused by physical factors such as tissue damage

biopsychosocial view of health views of health behaviour that incorporate (1) the biological and genetic factors that are involved in many illnesses, (2) the psychological factors, such as beliefs, that may inform behaviour change, and (3) sociological and demographic factors, such as age, race, peer- or reference-group, etc.

bipolar cells specialised sensory neurons for the transmission of senses

blind spot the specific area in the visual field that corresponds to the lack of light-detecting photoreceptor cells at the point of the optic nerve

blood-brain barrier a membrane structure that protects the brain from chemicals in the blood

bodily-kinaesthetic intelligence control of one's bodily motions and capacity to handle objects skillfully

body dissatisfaction a person's negative feelings about their body and their body shape that may be a risk factor for developing an eating disorder

bottom-up processing the perceptual processing of a visual (or other) object which is driven by the stimulus and which begins at the sense organ and ends in the higher centres of the brain

brightness constancy the tendency to perceive a surface as having a constant brightness in spite of actual changes in the brightness of the reflected light over the surface or over time

Broadbent's filter model a model of auditory selective attention which posits an attentional filter early in processing which excludes input on the basis of its physical characteristics

bulimia nervosa (BN) an eating disorder characterised by recurrent episodes of binge eating interspersed with periods of purging (e.g. self-induced vomiting, misuse of laxatives, diuretics, excessive exercise, etc.), and a tendency to consider body shape and weight as overly important in all areas of self-evaluation

bystander-calculus model in witnessing an emergency, people calculate the perceived costs and benefits of helping versus the perceived costs and benefits of not helping

bystander effect people are less likely to help others in an emergency when in the company of others than when alone. The greater the number of bystanders, the less likely one person is to help

C-fibres fibres which send slow pain messages

capacity model of attention a model of attention which posits that attentional capacity is limited but which is allocated according to task demands

catastrophic misinterpretation of bodily sensations a risk factor for panic disorder consisting of a cognitive bias towards accepting the more threatening interpretation of ambiguous bodily sensations

categorical self an understanding of the self in terms of categories and descriptions

causal attribution the inference process by which perceivers attribute an event to one or more potential causes

causal schemata conceptions based on experience about how particular causes for an event interact to produce particular effects

central executive a component of **working memory** which is responsible for planning and the allocation of processing resources

central nervous system (CNS) the largest part of the nervous system, including the brain and the spinal cord

central processing route characterised by a person's careful consideration and engagement with arguments in a persuasive communication

central resource theory the idea that there is a central bank of processing resources which is used to handle all kinds of task demands

central traits From Asch's configural model of impression formation, that certain traits have a major impact on the final impression formed about another person

cerebellum part of the extrapyramidal system. This region of the brain plays an important role in the integration of sensory perception and motor control

cerebrospinal fluid the clear bodily fluid that occupies the subarachnoid space and the ventricular system around and inside the brain

cerveau isole surgery involving the isolation of the forebrain

child-directed speech (CDS) simplified speech which is spoken to young children

communication the transmission of information

childhood amnesia the period until about three years old for which children seem to have no memories

chromosomes structures that contain the strands of DNA (genes). In humans there usually are 23 pairs of chromosomes, one from the mother and one from the father

cingulate cortex the cingulate cortex is a part of the brain situated in the medial aspect of the cortex. Part of the limbic system

classical conditioning a form of associative learning where a neutral stimulus (an original stimulus that does not evoke a particular response) becomes associated with a stimulus that is able to produce a reflex through repeated exposure to another stimulus that has already evoked that response (see **conditioned stimulus**)

client-centred therapy a type of holistic therapy developed by Carl Rogers that emphasises the need to consider the 'whole' person, and not just those 'bits' of the person that manifest psychopathology

clinical psychology the professional branch of psychology responsible for understanding and treating psychopathology

closure principle a Gestalt principle underpinning the law of pragnanz in which gaps in a stimulus are closed or completed to produce a good, whole figure

co-morbidity the diagnosis in a single individual of more than one psychological disorder

co-occurrence hypothesis states that people may use both systematic and heuristic processes when a persuasive message is ambiguous

cochlea the auditory portion of the inner ear

codons a sequence of three nucleotide bases that make an amino acid

cognitive appraisal with respect to emotions, the process through which physiological arousal is interpreted with respect to circumstances in the particular setting in which it is being experienced; also, the recognition and evaluation of a stressor to assess the demand, the size of the threat, the resources available for dealing with it, and appropriate coping strategies

cognitive-behavioural a therapeutic approach that combines the cognitive emphasis on the role of thoughts and attitudes influencing motivations and response with the behavioural emphasis on changing performance through modification of reinforcement contingencies.

cognitive dissonance theory Festinger's theory of cognitive consistency. Proposes that people are motivated to avoid the unpleasant feeling or tension associated with dissonant attitudes, usually by changing or rejecting one of the attitudes

cognitive miser people use the least demanding and least complex cognitions in producing a sought-after behaviour

cognitive stage of skill acquisition the initial stage of skill acquisition in which the nature of the problem is identified, the operations required to solve it are learnt or taught, appropriate strategies are applied and the problem solved. At this stage, knowledge is declarative and dependent on conscious application of that knowledge

cognitive x value theory in relation to motivation, that goal-directed behaviour is motivated by two cognitive judgements firstly, the strength of an individual's expectation that engagement in a particular behaviour will lead to goal obtainment (expectation value); secondly, the value that the individual places on the goal (incentive value)

cognitivism a theoretical approach to psychology that views behaviour as the result of information processing in the brain. It uses the metaphor that the mind is like a computer

cohort a group of individuals who are born at around the same historical time. Individuals from different cohorts are likely to have had different life experiences for example, people who were born in the 1930s and the 1950s

cohort model the idea that the initial sound of a spoken word activates a cohort of possible words in the listener and that this cohort is gradually reduced in size by successive sounds in the word. Cohorts are also reduced by contextual information

collectivist identity in a collectivist society, the interest of the group prevails over the interest of the individual

colour constancy the tendency to perceive a surface as having a constant colour in spite of actual changes in the colour of the reflected light over the surface or over time

commisures the small connective tissue between the hemispheres

competitive drugs drugs which compete for the same site on a receptor as the neurotransmitter

complex cells cells in the cortex which respond to line segments in a particular orientation located anywhere in the receptive fields of the simple cells that feed into the complex cells

compliance public and temporary change in behaviour and attitudes after being influenced by group pressure and persuasive requests. The effect is superficial

compulsive checking a form of obsessive-compulsive disorder (OCD) in which the individual experiences uncontrollable urges to persistently check things to ensure that the individual will not be responsible for any potentially harmful event occurring

compulsive washing a form of obsessive-compulsive disorder (OCD) in which the individual indulges in prolonged washing or cleaning rituals that serve to reduce the fear of dirt, contamination or illness

concept learning learning which instances are members of a given category and which are not

conceptualisation the initial stage in speech production in which the idea or ideas that are going to be communicated are formed

concordance studies studies designed to show that the probability with which a family member or relative will develop a psychopathology is dependent on how closely they are related – or more specifically, how much genetic material the two share in common

concurrent validity extent to which a test yields the same results as other measures of the same phenomenon

conditioned emotional response (CER) a technique used to train animals to elicit a fear response to a stimulus via classical conditioning

conditioned place preference (CPP) a method of assessing drug-seeking behaviour in an animal

conditioned response (CR) Pavlovian conditioning term. After a number of pairings of an unconditioned stimulus with a conditioned stimulus (CS), eventually the organism begins to produce a conditioned response to the CS (see also **conditioned stimulus**, **unconditioned stimulus** and **unconditioned response**)

conditioned stimulus (CS) Pavlovian conditioning term. A neutral stimulus that after conditioning produces a conditioned response (see also **conditioned response**, **unconditioned stimulus** and **unconditioned response**)

configuration approach Kelley's account of causal attribution for situations where there is incomplete data to base consensus, distinctiveness and consensus information. See **causal schemata**

confirmation bias (in hypothesis testing) the tendency to seek only information which confirms the hypothesis being tested

conformity private and enduring change in behaviour and attitudes after being influenced by group pressure or persuasive requests. The effect is deep-rooted

conscious, preconscious and unconscious the conscious, preconscious and unconscious are the component parts of the mind in psychoanalytic theory. The conscious contains thoughts and experiences. The preconscious contains memories available to the conscious. The unconscious contains biological drives and desires formed during childhood

consensus the extent to which other persons' responses to a particular event or stimulus are the same. From Kelley's covariation model

conservation a term used by Piaget to describe understanding that mass or volume remains the same despite being changed in some way, e.g. the shape of a clay ball being changed

conservative focusing strategy in the context of concept learning, a strategy which tests hypotheses as to the nature of a concept by changing one characteristic at a time in a systematic way

consistency the extent to which a person behaves in the same way in response to the same event or stimulus

consistency theories those theories that propose that people are motivated to maintain an equilibrium between attitudes, beliefs and behaviours. See also balance theory and cognitive dissonance theory

conspecifics members of the same species

constituents grammatically defined components of a sentence

construct validity the extent to which scores or ratings or an assessment instrument relate to other performance of subjects according to some theory or hypothesis. The theoretical basis of a model of behaviour (see also predictive validity and face validity)

constructive perception the idea that the percept is constructed from a combination of visual input, expectations, context and knowledge of the world

constructive process with reference to remembering, constructing a memory rather than simply retrieving a memory trace

constructivist this term is used in slightly different ways in developmental psychology. One use of the term is linked to Piagetian perspectives where emphasis is given to the way children build up their understanding of the world through their interaction with the world. A similar use is employed in relation to language development, where it is used to describe the way children are able to construct a grammar of a language through gradually building it up piece by piece

contact hypothesis states that bringing members of conflicting groups together will improve intergroup relations and reduce prejudice and discrimination

content words words such as the names of things or actions which carry the meaning of what is being said

context-dependent memory the observation that memories are best recalled, or even recalled at all, in the context in which they were acquired

context specific behaviours associated within one setting (i.e. you can only swim whilst in water!)

contiguity the temporal relationship between the conditioned stimulus and the unconditioned stimulus. The closer they are together, the stronger the learning

contingency the probability of a unconditioned stimulus following a conditioned stimulus

continuity the idea that there is a relation between earlier and later characteristics

continuity principle a Gestalt principle underpinning the law of pragnanz in which line edges or surfaces which are seen to be continuous are perceived as belonging to the same object

controlled processes processes which require attentional capacity, are largely under conscious control and which can be interrupted

convergence in visual perception, when the rods and cones synapse onto the bipolar cells. A number of rods converge onto one bipolar cell, whereas only a few cones converge onto a bipolar cell

conversion effect when minority social influence brings about an internal and private change in the attitudes or behaviour of the majority

coping activities designed to appraise stressors and to deal with their effects

corpus callosum the longitudinal fissure that connects the left and right hemispheres

correspondence bias the tendency to infer a person's dispositional attributes from his or her behaviour when other possible causes for the behaviour are also present. See also the fundamental attribution error

correspondence hypothesis (also principles of compatibility) a close association between attitude and behaviour measures will be shown if both measures are equivalent in their degree of specification about action, time, context and response

correspondence inference theory Jones and Davis' approach to how we make internal or dispositional attributions

cortex the outer part of the brain. The most recent part of the brain in evolutionary terms

corticotrophin-releasing hormone (CRH) a hormone which activates the autonomic and endocrine systems

cortisol a stress hormone released by the adrenal gland

cost-reward ratio from social exchange theory, the idea that people calculate the costs of being reinforced by another person and that this determines liking and attraction

counterconditioning a behaviour therapy technique based on extinction, but where the therapist attempts to attach a response to the anxiety-provoking events and situations that is inconsistent with anxiety

counterfactual reasoning the ability to reason about relationships that do not exist or are not described

covariation model Kelley's theory of causal attribution. People select the cause of a behaviour or event to the factor that covaries most with the behaviour

covariation principle states that given time and motivation people make attributions on the bases of perceiving the covariation of an effect and its hypothetical causes

covert attention attention which can be shifted internally and which doesn't require changes in orientation or eye movements

creative intelligence the ability to generate ideas or products that are both novel and appropriate to the circumstances

creativity in the context of the design characteristics of language, the characteristic referring to the ability to produce and understand an infinite number of novel utterances

criterion-referenced test an assessment that allows its users to make score interpretations of a student's performance in relation to a specified performance standard or criteria, rather than in comparison to the performances of other test-takers

cross-cultural psychology an approach to psychology that treats culture as a variable to be investigated. It emphasises the search for differences and similarities across cultures

cross-modal integration being able to integrate or respond to information involving two different dimensions (e.g. a sound and its location)

cross-sectional studies these investigations collect information from several age points, with different individuals at each age point

crystallised intelligence the facet of intelligence involving the knowledge a person has already acquired and the ability to access that knowledge; measured by vocabulary, arithmetic and general information tests

cultural transmission in the context of the design characteristics of language, the characteristic referring to the transmission of language between members of the species, usually from parents to offspring

daily hassles the irritating, frustrating, distressing demands that to some degree characterise everyday transactions with the environment (e.g. losing things, traffic jams, inclement weather, finding the coffee jar is empty, arguments, etc.)

decision criterion (β) the parameter in signal detection theory which reflects the participant's criterion for saying whether a signal was present or not

decision-making the process by which one chooses between different options to nominate one

declarative knowledge (in skill acquisition) the knowledge involved at the initial cognitive stage which is of a form that can be declared or expressed explicitly

decoupler according to Leslie, this enables children to form a secondary representation in pretend play

deduction the process of drawing conclusions about specific cases from general principles. Deduction is used to develop predictions from hypotheses as part of the hypothetico-deductive method

deductive reasoning the processes involved in drawing appropriate conclusions from given premises

defence mechanisms a psychoanalytic concept developed to describe those mechanisms whose function it is to deal with conflicts by keeping them in the unconscious. Examples include repression, denial and rationalisation

deliberative processing that type of cognitive processing that a person is aware of, has control over and has access to

delta waves Stage 3 sleep brain waves as measured by EEG.

delusions firmly held but erroneous beliefs – often found in those diagnosed with schizophrenia – that usually involve a misinterpretation of perceptions or experiences

democratic leadership A type of leadership characterised by consultation with and consent from other group members

demonology the belief, held by many ancient civilizations, that those exhibiting symptoms of psychopathology were possessed by bad spirits

dendrites the branched projections of a neuron that conduct the electrical stimulation received from other neural cells to the cell body

depolarising a reduction in the polarity of a neuron during an action potential

deprivation the loss of some experience, often used to refer to relationships or simulating experiences

depth perception the perception of the world as having a third dimension

determinism the belief that every behaviour is the result of identifiable causes

Diagnostic & Statistical Manual IV (DSM-IV-TR) in 1952 the American Psychiatric Association (APA) published their first Diagnostic and Statistical Manual (DSM) describing the symptoms for diagnosing psychopathology. This is now in its fourth edition, also with a text revision (TR)

diathesis-stress models a theory that explains behaviour as both a result of biological and genetic factors ('nature'), and life experiences ('nurture')

dichotic listening task a technique for determining the degree to which a participant can attend to the inputs to one or both ears

dichotomous traits characteristics that exist in different forms, e.g. eye colour

diencephalon a region of the brain made up of thalamic and hypothalamic structures

difference research research that looks for differences between groups of participants, in either experimental or quasi-experimental designs

diffusion of responsibility the belief that the presence of others in a situation makes one less responsible for the events that occur in that situation. See also the bystander effect

digit span the maximum number of digits that can be repeated back from immediate memory without error

Dimensions of Classification the five axes on which psychopathology and illness are diagnosed in DSM-IV-TR

direct perception immediately being able to perceive the nature of a stimulus. Often used to describe the idea that we perceive the nature of the world directly, without recourse to internal representations or stored knowledge or experience

direct social comparison a term referring the process through which people come to know themselves by evaluating their own attitudes, abilities and beliefs in comparison with others around them

discontinuity the idea that there is little or no relation between earlier and later characteristics

discounting principle states that the role of a cause in producing an effect is decreased if other possible causes are also present

discourse analysis general term applied to forms of textual analysis

discrimination the behavioural expression of prejudice

discriminative stimuli the ability to be able to tell two or more stimuli apart (associative learning term)

displacement in the context of the design characteristics of language, the characteristic referring to the ability to use language to refer to something in another place and/or at another time

dispositional cause causes of behaviour to do with things internal to the person being perceived such as personality, beliefs and attitudes

dissociation of function in the context of brain-damaged patients, when one function such as memory is impaired whilst another, such as language, seems to be unimpaired

distal stimulus the stimulus that is out there in the world; the real stimulus

distinctive feature a perceptual component of the stimulus which is crucial for perception of its identity

distinctiveness the extent to which a person's response to a particular event or stimulus is specific to that social situation or whether the response occurs for a number of events. From Kelley's covariation model

divided attention the area of attention concerned with determining the degree to which we can divide our attention between two or more simultaneous tasks

DNA (deoxyribonucleic acid) a double stranded molecule that codes the genetic sequence

dominant trait a genetic characteristic that when passed on to offspring overrides others

dopamine hypothesis in schizophrenia a theory of schizophrenia that claims that the symptoms of schizophrenia are importantly related to excess activity of the neurotransmitter dopamine

double-bind hypothesis a theory first put forward by Bateson (1956) that schizophrenia is caused by the individual being subjected within the family to contradictory messages from loved ones

double dissociation of function in the context of brain-damaged patients, when a patient shows impairment in function A (e.g. memory) with function B (e.g. language) being unimpaired, whilst another patient shows an impairment in function B with function A being unimpaired

dream analysis a method used by psychoanalysts to access unconscious beliefs and conflicts

drives internal states that arise in response to a disequilibrium in an animal's physiological needs

drive theory Zajonc's ideas about how the presence of others causes arousal which in turn motivates performance of habitual behaviours

drug self-administration a behavioural technique in which an animal performs a task in order to receive infusions of a drug. Used to measure reinforcement in addiction

dual-process dependency model Model of social influence in which informational and normative social influence occur separately

dual-route model a model of reading aloud which identifies two routes, one which converts written words to pronunciations which are then used to access meaning and a second route in which the written form is used to access meaning directly. This model supposes that irregular features of a language have to be learnt and produced on an individual basis, but that regular features are produced by computation of a rule

dual task paradigm an experimental paradigm in which performance on two tasks done simultaneously is compared with performance on either of the two tasks alone

duality of patterning in the context of the design characteristics of language, the characteristic referring to the fact that sounds can be combined to form new, large-sized units

dyslexia a specific learning disability that involves a difficulty with literacy

early selection models models in selective auditory attention which posit the existence of a selective filter or similar device early in auditory processing

echoic memory a very brief auditory memory for sensory information, analogous to iconic memory

ecological validity this type of validity refers to how well a study can be related to or reflects everyday, real life

efferent nerves nerves carry impulses *away* from the central nervous system to effectors such as muscles or glands

effortful processing processing which requires attention and conscious awareness and which can be interrupted. See **controlled processing**

ego the aspect of personality involved in self-preservation activities and in directing instinctual drives and urges into appropriate channels. In Freudian theory, the function of the ego is to find a balance between primitive drives, morals, and reality while satisfying the id and superego

egocentricity self-centred behaviour/actions/thoughts

egocentrism a term used by Piaget to describe the tendency to see the world from one's own perspective

elaboration likelihood model Petty and Cacioppo's model of attitude change in which when people attend carefully to the persuasive message they engage in central processing, but otherwise they engage in peripheral processing

elaboration mnemonics memory techniques which rely on linking the to-be-remembered material to rhymes, visual images or other materials in as salient a way as possible with the purpose of aiding retrieval of the material

electrical synapse a link between two neurons at a gap junction in which electrical conduction can be transmitted from one cell to another. Allows very fast signalling

electroconvulsive therapy (ECT) a form of treatment for mental health problems where an electric current is passed very briefly (usually 0.5 seconds) between two electrodes attached to the head of the patient to induce a convulsive seizure similar to an epileptic fit

electro-dermal activity a term used to describe changes in the skin's ability to conduct electricity

electroencephalogram (EEG) a tool for the measurement of the electrical activity of the brain by recording from electrodes placed on the scalp

electrostatic pressure an electrical force between ions across the membrane

emotional experience a complex pattern of changes, including physiological arousal, feelings, cognitive processes and behavioural reactions, made in response to a situation perceived to be personally significant

emotional intelligence type of intelligence defined as the abilities to perceive, appraise and express emotions accurately and appropriately, to use emotions to facilitate thinking, to understand and analyse emotions, to use emotional knowledge effectively, and to regulate one's emotions to promote both emotional and intellectual growth

empathy emotional state that occurs when one witnesses the emotional state of another person. In some forms of holistic therapy, empathy is the ability to understand and experience the client's own feelings and personal meanings

empathy–altruism hypothesis Batson's ideas that experiencing empathy for another person in need provides the motivation for altruistic behaviour

empiricist a person who believes that experience has the strongest effect on ideas and development

encoding the processes by which to-be-remembered material is put into memory in a cognitively appropriate way

encoding specificity principle the idea that remembering material depends on the overlap between the conditions at retrieval and the conditions when the memory trace was laid down

end state (of problem-solving) the point at which, according to Newell and Simon, a problem is solved

endocrine glands glands that secrete their product (hormones) directly into the blood rather than through a duct

environment the total external context in which an individual exists, including physical and social factors

enzymatic metabolism the conversion of neurotransmitter substance into metabolites by enzymes

episodic memory the memory system which deals with information about the events or episodes in life

epistemology the study of the nature of knowledge, and of how knowledge can be generated. Different epistemologies suggest different ways of knowing, and hence different research methods

equilibration a term used by Piaget to describe the balance between experiences and the understanding of these experiences, a discrepancy provides a motivation for discovery and investigation

equity theory in any social interaction, the idea that liking is dependent upon one's interpretation of the input-output ratio for the self and for the other person. If the relative input-output ratios are equal, liking will result

ethnocentrism the view that one's own cultural beliefs and practices represent a norm that other cultures should conform to

ethology the study of behaviour and its evolutionary causes

evaluation apprehension model presence of others results in drive because people have learned to be apprehensive about being evaluated by others

exchange errors errors in speech production which involve words or parts of words exchanging places in the utterance

excitation-transfer approach aggression is the result of learned behaviour, excitation or arousal from another source and the interpretation of this arousal

excitation transfer theory a psychological process in which arousal caused by one stimulus is transferred and added to arousal elicited by a second stimulus

excitatory postsynaptic potential (EPSP) temporary depolarisation of a neuron. They are graded, with larger ones increasing the probability of producing an action potential (see also **inhibitory postsynaptic potential (IPSP)**)

executive functioning higher-order mental processes concerned with the co-ordination of other cognitive processes such as inhibition and memory

executive self the recognition that one is able to influence one's environment

expectancy effects an improvement in a client's condition following psychological treatment simply because they 'expected' the treatment to make them better

expectancy theory a cognitive theory of work motivation that proposes that workers are motivated when they expect their efforts and job performance to result in desired outcomes

expectancy-value approach states that decision-making is based on a person's expectancies that they will receive a particular outcome, and the value (or valence) that the person attaches to the outcome

expected utility the product of the value of an outcome (e.g. the amount of money that can be won) and the probability of that outcome occurring (e.g. remote)

experimental control the taking of steps to ensure that the only thing that varies in an experiment is the independent variable manipulated by the experimenter. If other factors vary in an experiment then these may confound the results of the study, meaning that we can't be sure that the independent variable caused any change in the dependent variable

experimental reductionism an approach to investigation that emphasises the need to reduce complex phenomena to simple effects that can be investigated experimentally

expertise a 'fuzzy' concept referring to the point in skill acquisition at which a person can be considered to know more and/or be more able to solve a problem more easily than most of his/her peers

explicit term used by Karmiloff-Smith and others to describe the ability to use speech to describe cognitive representations used in problem solving and other tasks

explicit processes processes which require intent and conscious recollection to search for and retrieve information from memory

exposure therapy a collective term for those therapies that treat psychopathology by exposing the client to the stimuli or events that make them anxious or apprehensive

expressed emotion (EE) a measure of the 'amount' of emotion displayed, typically in the family setting, usually by a family or caretakers of those with a psychopathology, and is viewed as a factor causing relapse in psychopathologies such as schizophrenia

external locus of control a concept initially used to describe a situation in which outcomes are believed to be determined by chance

exteroceptive stimulus in associative learning, an external stimulus like a light or tone (see also **interoceptive stimulus**)

extinction in associative learning, the cessation of responding as a result of the absence of a reinforcer or unconditioned stimulus

extinction therapies a collective term for those behaviour therapies that are based on the classical conditioning principle of extinction

extracellular fluid body fluid outside of cells (see also **intracellular fluid**)

extracellular thirst caused by a reduction in the volume of fluid found between cells

extrapyramidal system a motor system that comprises of the basal ganglia and the cerebellum

extrinsic motivation the desire or push to perform a certain behaviour based on the potential external rewards that may be received as a result

extroversion marked by interest in and behaviour directed toward others or the environment as opposed to or to the exclusion of self; gregarious or outgoing

face validity the extent to which a measure appears on the surface to measure what it is suppose to measure, or to which there is a similarity between the model and the behaviour to be modelled, e.g. the symptoms of a disorder and the behaviour in an animal

facial feedback hypothesis of emotion the notion that our awareness of facial expression influences the way we feel

false autonomic feedback providing false feedback to individuals regarding their levels of physiological arousal, often as a way to see how this false information impacts on their real levels of physiological arousal

false consensus effect the tendency to overestimate how common one's own behaviour is or attitudes are among other people

falsifiability the principle, introduced by Popper, that good scientific theories should be capable of being found to be false

family therapy a specific form of group therapy that attempts to deal with psychopathology that may result from the relationship dynamics within the family

'faulty' learning a term used by behaviourists to describe the kind of learning that may give rise to symptoms of psychopathology

fear appeals types of persuasive communications that try to motivate people to change their attitudes or behaviour by inducing fear in the recipient

fear hierarchy in systematic desensitisation therapy, a ranked list of events that cause increasing fear or anxiety that can be used as the basis of exposure to anxiety-provoking events

feature detection theory the theory that we recognise objects on the basis of the match between their distinctive features and lists of distinctive features of objects stored in memory

feature detectors detectors, physiological or in artificial systems, which become activated in the presence of particular distinctive features

feminist psychology an approach to psychology founded on a belief in the worth of women, and the need to achieve social change to address gender inequality

figure-ground segregation the processes by which objects are seen as separate from each other and from the background

fissure a groove, a natural division in the cortex

fixed interval schedules (FI) in operant conditioning, when a reinforcer is delivered after a predetermined interval if a response has been made

fixed ratio schedule (FR) in operant conditioning, when a reinforcer is delivered after a predetermined number of responses has been made

flashbulb memories memories which are very vivid, usually because they are of events which were dramatic, surprising and of an emotional nature

flooding an extinction-based therapy that involves therapist-led prolonged exposure to the emotionally provoking event or situation

fluid intelligence the aspect of intelligence that involves the ability to see complex relationships and solve problems

focal theory the idea put forward by Coleman (1980) that adolescence involves difficulties for some individuals at some times

focus gambling strategy (of concept learning) a strategy in which the participant gambles on finding the right answer quickly by producing possible answers which differ from each other in several ways, as opposed to producing answers which differ from each other systematically and in only one way

focused auditory attention the area of attention dealing with the ability to focus on some auditory inputs and exclude others

focused visual attention the area of attention dealing with the ability to focus on some aspects of the visual array and exclude others

formulation the second main stage in speech production, in which the conceptual message has to be translated into a linguistic form ready to be spoken

fornix a bundle of axons in the brain; carries signals from the hippocampus to the hypothalamus

free association a psychoanalytic technique where the client is encouraged to verbalise all thoughts, feelings and images that come to mind

free recall a memory paradigm which requires the participant to repeat back presented information, without constraints on the order or manner of recall

free-riding leaving it to other group members to perform a group task because the person believes their skills to be dispensible

free will the idea that we can exert conscious control over our actions, rather than behaviour being determined by other causes

frontal lobes a region of the brain located at the front of each cerebral hemisphere

function words words which themselves carry no meaning (i.e. they don't name actions or things) but which are necessary to bind the content words together into a meaningful utterance, e.g. 'to', 'from' and 'by'

functional analysis in behaviour modification, an analysis used to try and understand what rewarding or reinforcing factors might be maintaining an inappropriate or maladaptive behaviour

functional fixedness the tendency in problem solving to focus on a single function of a prop in the problem situation and to ignore its other possible functions

functional level one of the stages in syntactic planning in speech production. In this stage, the relationship between the main meaning-carrying words (nouns, verbs, etc.) is specified

fundamental attribution error the tendency for people to underestimate the role of situational factors and overestimate the role of dispositional factors in explaining behaviour. See **correspondence bias**

gambler's fallacy the notion held by gamblers that events on which they gamble are not independent and occur in runs, a conclusion of which is that a run of bad luck will inevitably be followed by a run of good luck

garden path sentence a sentence which leads the listener/reader to begin deriving one interpretation before s/he finds out that the full sentence has a different interpretation. The listener/reader is led up the garden path

gate control theory of pain a theory of pain perception developed by Melzack and Wall (1965) in which they argue that a gate exists at the level of the spinal cord that integrates (1) information about the injury received from the site of the injury, (2) descending input from the brain, providing information about the individual's behavioural state, and (3) input from large and small fibres which make up some of the physiological input into pain perception

gender identity an awareness of being male or female

general intelligence (g) a general factor of intelligence that governs performance on all cognitive tasks

general paresis a mental disorder first described in the nineteenth century that had syphilis as one of its main causes

generalized anxiety disorder (GAD) a commonly diagnosed anxiety disorder whose main diagnostic feature is chronic and uncontrollable worry

generation gap the idea that there is a difference and conflict between adolescents and the people of their parents' generation

genes the basic unit of heredity, these are regions of a chromosome that control the production of a protein which in turn often controls a specific characteristic

genetics the study of genes and inheritance

genetic model Moskovici's ideas of how conflict between minorities and majorities can alter the attitudes and behaviour of the majority

genotype the genetic make-up of an individual (see also **phenotype**)

geons a set of three-dimensional components, such as arcs and cubes, which in different combinations are hypothesised to specify the nature of all visual objects

glial cells the support cells for neurons in the CNS which provide nutrition, maintain homeostasis and form myelin

Global Assessment of Functioning Scale (GAF) a system that is used to assess adaptive functioning, and acts as a measure of psychological health that can be contrasted with measures of psychopathology

globus pallidus a region of the basal ganglia

glucocorticoid a steroid hormone, e.g. cortisol

glucogon a pancreatic hormone that converts stored glycogen back into glucose

glucoreceptors receptors which detect the level of glucose

glycogen stored glucose

goal setting theory that people are motivated to work towards and achieve goals

good psychological health the area of functioning that is measured by instruments such as the Global Assessment of Functioning Scale (GAF)

graduated exposure a term that refers to the gradual exposure of the client to anxiety-provoking stimuli or situations

grammar a set of rules that specify how the words in a sentence in a given language can and cannot be combined to produce a meaningful utterance

group two or more people who share a common definition and evaluation of themselves and behave in accordance with that definition

group norm commonalities in attitudes and behaviours that define group membership and differentiate between groups

group polarisation following group discussion, a change in the average position of a group on some issue in the direction of the original group norm on that issue

group therapy any form of therapeutic treatment in which clients are treated in groups rather than on a one-to-one client-therapist basis (e.g. self-help groups, experiential and encounter groups, etc.)

groupthink a way of thinking in very cohesive groups. The desire to reach an unanimous decision overrides the motivation to use logical and reasoned decision-making processes

guided participation adults providing suggestions and direction to children's activities

gyri (plural of gyrus) The ridges on the cortex (see also **sulci**)

habituation a form of learning in which the response to a stimulus decreases until the stimulus is ignored if it does not convey any meaning

hallucinations the perception of things that are not actually present, such as the auditory hallucinations that are a common feature of schizophrenia

halo effect the likelihood that a positive impression will be formed of a person if positive information is received about that person, and a negative impression will be formed if negative information is received

health belief models models designed to describe those factors that predict health behaviours, and to try to explain how the predictors of healthy behaviour influence the set of 'health beliefs' that every individual has

health locus of control the extent to which an individual believes that their health is controlled by them (an internal locus of control) or by factors external to them (an external locus of control)

health psychology the scientific study of the psychological processes of health, illness and health care, and, in particular, its contribution to (1) the promotion and maintenance of health, (2) the prevention and treatment of illness, (3) the identification of aetiological and diagnostic correlates of health, illness and related dysfunctions, and (4) the analysis and improvement of the health care system and health policy information

helping a type of pro-social behaviour. Intentional actions that benefit other people

heredity the process by which biologically based characteristics are transmitted to offspring

heritability the degree of inheritance of a given trait or behaviour, assessed by the degree of similarity between individuals who vary in the extent of their genetic similarity

heteroceptors presynaptic receptors that receive messages from other neurons

heterosexism bias arising from negative views towards or treatment of homosexuals

heuristic systematic model Chaiken's model of attitude change, in which when people attend carefully to the persuasive message they engage in systematic processing, but otherwise they process the information using heuristics or cognitive short-cuts

heuristics 'rules of thumb' used in problem-solving, probabilistic judgement and decision-making

hippocampus part of the forebrain, located in the medial temporal lobe. It forms a part of the limbic system and is involved in memory

holistic therapies those therapeutic treatments that attempt to treat the whole person and enable them to make their own decisions and solve their own problems (e.g. 'humanistic therapies' such as client-centred therapy)

holophrases a term used to refer to the possibility that the single word utterances of young children have a similar meaning to a phrase or sentence

homeostasis constancy or equilibrium of the internal conditions of the body

horizontal cells a layer of retinal cells that are involved in lateral inhibition

hormones hormones are chemicals that are secreted by endocrine glands entering the bloodstream to their destination

humanism an approach to psychology that emphasises the whole person and the human's potential for change

humanistic a psychological model that emphasises an individual's phenomenal world and inherent capacity for making rational choices and developing to maximum potential

Huntington's disease a rare genetic neurological disorder typified by abnormal movements of the body (sometimes referred to as Huntington's Chorea)

hypercomplex cells cells in the cortex which respond to specific stimuli such as corners and angles

hyperphagia eating too much

hyperpolarisation when the membrane potential of a neuron becomes more polarised (see **depolarisation**)

hyperventilation breathing faster and/or deeper than necessary, thereby reducing the carbon dioxide concentration of the blood below normal. A possible causal factor in the precipitation of panic attacks

hypothalamic-pituitary portal system a networks of capillaries in which the hypothalamus can communicate with the anterior pituitary gland

hypothalamus a gland in the brain below the thalamus. Involved in homeostasis

hypothesis formation in the context of inductive reasoning, the formation of an hypothesis to explain the phenomenon

hypothetical construct psychologists characterise phenomena in theoretical terms, as hypothetical constructs. These constructs remain hypothetical until their existence can be confirmed through investigation

hypothetico-deductive method a technique of investigation that involves developing specific predictions, or hypotheses, on the basis of a psychological theory. These predictions are then tested in an empirical investigation. If the results of the study confirm the predictions, then the theory is supported

hypovolemic thirst This thirst occurs when the intravascular fluid decreases (see also **osmotic thirst**)

iconic memory a high-capacity visual memory for holding large amounts of sensory information for very short periods of time

id in psychoanalytic theory, the primitive, subconscious part of the mind that operates irrationally and acts on impulse to pursue pleasure

id, ego and superego the id, ego and superego are the component parts of the personality in psychoanalytic theory. The id consists of instincts that demand satisfaction. The ego is a rational mechanism to decide between the demands of the id and the demands of the outside world. The superego is an internalised moral self that rewards and punishes adherence to restrictions on behaviour

identity conflict the person has several commitments which prescribe conflicting behavioural imperatives in some situations, such that at least one commitment may have to be betrayed

identity deficit the individual experiences a lack of guiding commitments but struggles to establish personal goals and values

identity-reference group where belonging to a group involves identification with the group and where membership acts as a reference point for a person to know who they are. See also social identity and reference group

idiographic relating to or involving the study of individuals

idiographic test investigators believe that personality must be studied in terms of its own organisation and not in comparison to other personalities. The idiographic approach also stresses the study of the whole personality

ill-defined problems problems in which the relevant information may not be known and the demands of the problem (what has to be done) may also not be known

immediacy principle the idea that parsing begins immediately – from the first word input

implicit Karmiloff-Smith uses this term to describe cognitive processes which are not available to consciousness and report

implicit association test	a measure of implicit attitudes
implicit attitudes	evaluative tendencies that influence judgements and behaviours but which the perceiver is not aware of
implicit personality theory	general expectation about the characteristics and beliefs of a person based on knowledge about central traits
implicit processes	processes which reveal the existence of memories but which do so without intent or conscious recollection
impression formation	the psychology processes by which we form impressions of other people. See also primacy effects, recency effects, implicit personality, central traits, peripheral traits and halo effect
impression management	the use of various strategies by people to get others to form positive impressions of them
imprinting	in relation to social relationships, the innate process by which newborn animals become attached, usually to their mother
in vitro	the technique of performing a given experiment in a controlled environment outside of a living organism, e.g. the axon (see also in vivo)
in vivo	an experiment done in or on the living tissue of a whole, living organism as opposed to a single cell (see also in vitro)
incentives	external stimuli or rewards that motivate behaviour although they do not relate directly to biological needs
incidental learning	learning which occurs without intent and without conscious awareness that something is being learned
individualist identity	in a individualist society the interest of the single person prevails over the interest of the group
induced compliance experiment	a way to induce cognitive dissonance. The participant is persuaded to behave in a way inconsistent with their attitudes or beliefs
induction	the process of drawing general principles from specific instances. Psychologists use induction to develop theories on the basis of observations
inductive reasoning	the processes by which one comes to conclusions which are probabilistic rather than certain
infants	usually considered by psychologists to be children below about 24 months of age
inferior colliculus	the principal midbrain nucleus of the auditory pathway
information processing	an emphasis on the way that more effective use of information enables cognitive advances to take place
informational social influence	an influence type to accept information from another source as true and reflecting reality
ingroup	a group to which a person belongs or to which they think they belong
inhibitory postsynaptic potential (IPSP)	temporary hyperpolarisation of a neuron. They are graded, with larger ones decreasing the probability of producing an action potential (see also excitatory postsynaptic potential (EPSP))
initial state (of problem-solving)	the initial stage in problem-solving according to Newell and Simon (1961), in which the unsolved problem is stated
insight	the processes, achieved suddenly, whereby a problem is reconfigured or restructured and thereby solved
insomnia	the inability to fall asleep and/or the inability to remain asleep for a reasonable amount of time
instincts	pre-programmed tendencies that are essential to a species' survival
interference	in reference to forgetting, the idea that memories can become confused with each other, resulting in an impaired ability to remember one without intrusion from another
intergroup behaviour	the actions of one group of individuals towards another group of individuals
intermediate states	the states, according to Newell and Simon (1961), between the initial state and the final state. Each intermediate state is a path to the solution to the problem
internal consistency reliability	a measure of reliability; the degree to which a test yields similar scores across its different parts, such as on odd versus even items
internal locus of control	a concept initially used to describe a situation in which outcomes are believed to be determined by effort/skill
International List of Causes of Death (ICD)	In 1939 the World Health Organization (WHO) created the first extensive system for classifying psychopathology and added psychological disorders to the International List of Causes of Death (ICD)
interneuron	a neuron that is neither sensory nor motor but connects the two
interoceptive stimuli	the internal physiological state of an organism that acts as a stimulus, e.g. a drug effect
interpersonal distance zones	Hall's analysis of the use and effects of non-verbal cues as a function of distance between communicators
interpersonal intelligence	ability to relate to and understand others
interposition	a cue to depth based on the fact that a near object hides parts of a more distant object because it is interposed between the viewer and the distant object
interpretation	a trained skill used by psychoanalytic therapists to help the client to identify important underlying conflicts and develop ways of dealing with these conflicts
interpretative repertoires	discrete set of metaphors and images drawn upon in talk to construct a particular object
interstitial fluid	the fluid which is located between cells and surrounds them
intersubjectivity	an awareness of another's intentions and consciousness
intracellular fluid	the body fluid on the inside of cells (see also extracellular fluid)
intracellular thirst	thirst generated by decreased water volume
intracranial self-stimulation (ICSS)	a behavioural technique in which an animal performs a task in order to receive electrical stimulation from an electrode planted in the brain. Used to measure reinforcement in addiction

intrapersonal intelligence having an understanding of yourself; knowing who you are, what you can do and what you want to do

intravascular fluid blood plasma

intrinsic of or relating to the essential nature of a thing; inherent

introversion preoccupation with oneself and accompanying reduction of interest in the outside world

intuitive definitions definitions of what people understand by the word intelligence obtained through intuition rather than from reasoning or observation

inverse agonist an agent which binds to the same receptor binding-site as an agonist for that receptor but exerts the opposite pharmacological effect

ion channel the site at which an ion can gain passage to either side of the cell membrane

ionotropic receptors receptors in which ion channels are opened or closed in response to a chemical messenger

IQ an index derived from standardised tests of intelligence; originally obtained by dividing an individual's mental age by chronological age and then multiplying by 100; now directly computed as an IQ test score

James-Lange somatic theory of emotion a peripheral-feedback theory of emotion stating that an eliciting stimulus triggers a behavioural response that sends different sensory and motor feedback to the brain and creates the feeling of a specific emotion

joint attention usually refers to the attention of an infant and adult to the same object or event

judgement the drawing of a conclusion, usually probabilistic, from a combination of knowledge and observation

just world hypothesis Lerner's idea that people have the belief that others get what they deserve. People try to maintain this just world belief

Klüver-Bucy syndrome a behavioural disorder that occurs when both the right and left medial temporal lobes of the brain malfunction

knowledge-based processes in human error processes such as thinking, reasoning, creativity and design which are rooted in knowledge of the world and how it works, failures in which lead to human error

laissez-faire leaders leaders who are not interested in the views and opinions of other group members

language there is no one definition of this term. A form of communication where the organisation of the elements can result in different meanings, and where there is structural dependency between these elements

language acquisition device (LAD) the supposition that children acquire language by matching the speech they hear to appropriate elements of universal grammar

late selection models models in selective auditory attention which posit the existence of a selective mechanism late in auditory processing

latent conditions in the study of human error, systemic conditions in which errors are likely to occur

latent learning a form of learning that is not immediately expressed in an overt response

lateral geniculate nucleus (LGN) part of the thalamus which processes visual information received from the retina

lateral hypothalamus (LH) part of the hypothalamus

lateral inhibition a type of cell-to-cell interaction whereby one cell inhibits its immediate neighbours from activating

law of pragnanz the Gestalt idea that there is a strong tendency in perception to see the best figure

leadership a role defined by the group for getting other group members to realise the groups' goals

learned helplessness theory a theory of depression first proposed by Seligman (1976), in which depression may be caused by the individual experiencing unavoidable and uncontrollable negative life events

learning model the theoretical approach to psychopathology and treatment that is based on behaviourist principles and learning theory (e.g. operant and classical conditioning)

lemma an early, abstract form of a word which will later be output

leptin a peptide hormone that is produced by fat cells and plays a role in body weight regulation by acting on the hypothalamus to suppress appetite and burn fat stored in adipose tissue

levels of explanation a given psychological phenomenon can be explained at a number of levels, corresponding to the units used in explanations. Examples include the social psychological level, where explanations are in terms of inter-personal behaviour, and the physiological level, where explanations are in terms of brain operation or genetics

levels of processing the idea that memory for information is an incidental consequence of the depth to which the information has been processed

lexical decision task a task which presents participants with a letter string which may or may not be a word and which requires him/her to decide as quickly as possible which it is

lexical selection the first stage of lexicalisation, in which words that fit the desired meaning are selected from the mental lexicon

lexicalisation the process by which a word meaning is turned into a blueprint for the sound

lexicon the representations which underpin our knowledge and use of words

libido in Freudian theory, the instinctual or energy force that drives the id

lie detection the practice of determining whether someone is lying

life events external events or experiences which will represent either challenges (e.g. a new job), losses (e.g. death of a close relative) or threats (e.g. the threat of redundancy)

ligands a molecule that binds to a receptor

likert scale a technique for measuring attitudes. People rate their agreement or disagreement with a number of statements about a particular attitude object

liking to feel attraction toward another person or object and take pleasure in their company

limbic system a system within the brain that consists of the hippocampus, amygdala, cingulate cortex, fornix, septum and mamillary bodies

linear perspective the way in which parallel lines appear to converge as they recede from the observer is a cue to depth and distance from the observer

linguistic intelligence the ability to use words and language

locus of control the extent to which people believe that events can be controlled by them (an internal locus of control) or that those events happen to them because they are controlled by external factors (an external locus of control)

logical concepts logical concepts are governed by and identified by clear and unambiguous rules. Examples and non-examples of the concept are distinguished by rule

logical definitions definitions of what people understand by the word intelligence obtained through reasoning and observation

logical-mathematical the ability to use reason, logic and numbers

logogen model a model of word recognition in which word meaning is represented by a logogen and which collects evidence from both the input and the context until the logogen's threshold of activation is exceeded and it fires

logogen threshold the amount of evidence required before a logogen fires

long-term memory a general reference to memories that are retained for a long time. Technically, memories that survive for more than about half a minute in the absence of rehearsal

long-term potentiation (LTP) the long-lasting enhancement in communication between two neurons that results from stimulating them simultaneously. Considered to be the neural basis of memory

longitudinal a study that follows of participants over a period of time, usually over one or more years

loss aversion when a loss counts more than it should logically, resulting in an inclination to make a judgement which entails loss

loving the emotions, cognitions and behaviours that are involved in an intimate relationship

machine reductionism the view that we can understand human behaviour in terms of the operation of machines, particularly computers

magnocellular layer a layer of cells in the lateral geniculate nucleus

major depression a common mood disorder characterised by a persistent lowering of mood, loss of interest in usual activities and diminished ability to experience pleasure

majority influence social influence effect due to exposure to the opinions of a majority or a majority in one's own group. See also **conformity**

malapropism a speech error in which the target and error sound similar, especially in the initial and subsequent sounds

mammillary bodies hypothalamic nuclei

mastery goals (also called learning goals) which focus on gaining competence or mastering a new set of knowledge or skills

means-end analysis a problem-solving heuristic (Newell and Simon, 1961) which breaks the problem down into a series of sub-goals on the road to the solution, with each sub-goal becoming an end in itself

medial geniculate nucleus a region of the thalamus

median preoptic nucleus a region of the hypothalamus

meiosis the cellular division between gametes that results in each gamete (sperm or egg) having half the full complement of chromosomes (haploid) (see also **mitosis**)

melanin-concentrating hormone (MCH) a neuropeptide released by the hypothalamus

membership group a group to which one belongs based on some objective external criterion

meninges the meninges consist of three layers the dura mater, the arachnoid mater and the pia mater. The primary function of the meninges and of the cerebrospinal fluid is to protect the central nervous system

mental lexicon a mental dictionary which stores information about words known to the person in question, including orthographic, phonological and semantic information

mental set a term from Gestalt psychology which refers to a tendency to continue applying a previously successful strategy to a series of problems even when it becomes inappropriate

mere exposure effect that repeated exposure to an object or person will influence levels of attraction or liking

mesencephalon midbrain; divided into two – the tectum and tegmentum

mesolimbic pathway a dopamine pathway that links the ventral tegmental area to the nucleus accumbens

messenger ribonucleic acid (mRNA) mRNA is transcribed from a DNA template, and carries coding information from the nucleus to the sites of protein synthesis

metabolites the converted substance of a neurotransmitter or other chemical

metabotropic receptors a type of receptor which, when activated, triggers a series of intracellular events (e.g. second messengers) that opens ion channels

metamemory children's ability to think about memory processes

metarepresentation representations about other representations. For example, knowledge about memory processes would involve metamemory

metencephalon a brain region composed of the pons and the cerebellum

method of loci an ancient technique for remembering information by 'depositing' components of that information at various imaginal locations and subsequently recovering the information from those same locations

microgenetic study a method of data collection where detailed observations of the process of change are made

microtubules fibres that carry neurotransmitter vesicles to the nerve terminal

min strategy a strategy identified by Siegler that involves counting from the larger number when adding up two numbers

mindblindness a term used by Baron-Cohen to describe the inability of individuals with autism to understand the viewpoints of others

mindmindedness a term used to describe the way adults comment to an infant on what they believe the infant is thinking

minimal group paradigm an experimental procedure for creating groups on very arbitrary criteria. Used to look at the effect of social categorisation on behaviour

minority influence social influence effect due to exposure to the opinions of a minority or a minority in one's own group

mitochondria a specialised subunit of the cell that provides the cell's energy

mitosis the process by which a cell duplicates the chromosomes in its nucleus in order to generate two identical daughter nuclei

mnemonic techniques specific devices to help you memorise lists of words

modal model of memory the model of memory posited by Atkinson and Shiffrin (1968) which hypothesises the linear transmission of information from sensory through short-term to long-term memory, with rehearsal playing a major part in the transfer from short- to long-term memory

MODE model stands for Motivation and Opportunities as Determinants. A model that proposes how attitudes affect behaviour through both deliberative processing and spontaneous processing

modelling the tendency for people to acquire new ways of behaving based on the observation of others' behaviours. See also social learning theory

molecular genetics the field of biology which studies the structure and function of genes at a molecular level

monoamine oxidase inhibitors (MAOIs) a group of drugs used to treat symptoms of depression (such as phenelzine and tranylcypromine)

monocular cues cues such as texture gradient and linear perspective which rely on only one eye and which indicate depth or distance

mood-dependent memory a variant of context-dependent memory in which the person's mood plays the role of context. That is, information acquired in a given mood is best recalled when in the same mood

mood disorders those diagnosable psychological disorders such as Major Depression or Bipolar Disorder that are characterised by disturbances in normal levels of mood

moral realism judgements of moral reasoning that are based on the consequences of an action, often the amount of damage

moral subjectivism judgements of moral reasoning that are based on the intentions or motivations of the person

morphosyntax the linguistic rules concerned with the order of words in a sentence and the rules concerned with grammatical elements of words

motion parallax the apparent movement of a stationary objects when the observer is moving. The apparent relative movement of two or more objects is a cue to depth or distance

motivated forgetting the Freudian idea that forgetting occurs because the person wants to forget, usually because the information is unpleasant and even traumatic in nature

motivated tactician that people have many cognitive strategies available for them to choose based on their own needs, motives and goals

motivation the process of starting, directing, and maintaining physical and psychological activities; includes mechanisms involved in preferences for one activity over another and the vigour and persistence of responses

Muller-Lyer illusion the illusion in which two lines of equal length are seen as being of different lengths when the extremities of one have arrow heads which point towards the centre while the other has arrow heads which point away from the centre

multi-dimensional approach an approach to understanding the concept of attitude that focuses on the central roles of cognition, affect and behaviour important in the evaluation of an object, person or issue

multiple intelligences conceived by Howard Gardner, multiple intelligences are seven different ways to demonstrate intellectual ability

multiple necessary schemata conceptions that causes operate together to produce an effect. Important when events are unusual or extreme

multiple resource theory the idea that cognitive processing is both limited and dependent on several processing resources, each of which is specific to tasks of a particular kind, e.g. visual

multiple sufficient causal schemata conceptions that any number of causes acting by themselves can produce the same effect

musical intelligence ability to produce and appreciate music

myelencephalon part of the hindbrain

myelin the electrically insulating layer that surrounds the axons. It is an outgrowth of glial cells

naïve scientist characterising people as being rational and using cause-effect type analyses to understand their social world

narcolepsy a neurological condition most characterised by excessive daytime sleepiness

nativist a person who believes that the strongest effect on development is from our genes

natural concepts natural concepts, such as 'dog', have fuzzy boundaries which blur the distinction between examples and non-examples of the concept. Contrast with **logical concepts**

nature the influence of inherited or biological processes on development

negative reinforcement when a reinforcer that increases the probability of a behaviour is the *removal* of an aversive stimulus

negative state relief theory proposes that helping others is one mechanism we use to relieve the distress caused by witnessing another in need

negative symptoms in schizophrenia symptoms of schizophrenia that represent the absence of normal behaviour, and include withdrawal from social contact, flat affect and lack of emotional expression

negative triad a set of negative beliefs proposed by Beck (1976) to underlie depression. They are negative views of the self (e.g. 'I am unattractive'), negative views of the future (e.g. 'I will never achieve anything') and negative views of the world (e.g. 'the world is a dangerous and unsupportive place')

nerve growth factor (NGF) a protein which induces the differentiation and survival of particular target neurons

neural tube in neurodevelopment, this is the embryo's precursor to the central nervous system

neurogenetic determinism the view that behaviour and human nature are determined by brain structures and genetic inheritance

neuromuscular junction (NMJ) the synapse at which neural messages communicate with muscles

neurons the main cells of the brain that are electrically excitable and that process and transmit information

neuropeptide y (NPY) a type of peptide that is involved feeding behaviours

neurosecretory cells neurons that transport hormones from hypothalamus to the posterior pituitary gland

new paradigm research new paradigm research rejects the use of the hypothetico-deductive method, and the notion of objectivity. New paradigm researchers emphasise the use of qualitative methods to gather rich information about individuals; the collaborative role of research participants; and the subjective interpretation of the investigator

nicotine a chemical found in tobacco and the principal agent for maintaining smoking

nociception pain perception

nodes of ranvier gaps in the myelin sheath

nomothetic of or relating to the general case, especially in relation to the search for general laws or traits in the study of personality

non-common effects part of correspondence inference theory. Effects of behaviour that are specific and exclusive to that behaviour and not to other behaviours

non-competitive drugs drugs that do not act at the same site as the neurotransmitter

non-verbal communication the process of transferring information from one person to another using means other than the spoken or written language. For example, gestures, body posture and facial expressions

normal distribution curve the symmetrical curve that represents the distribution of scores on many psychological attributes; allows researchers to judge how unusual an observation or result is

normative social influence an influence type to conform to the expectation of others so as to gain social approval and avoid social disapproval

normative test a type of test, assessment or evaluation in which the tested individual is compared to a sample of his or her peers (referred to as a 'normative sample')

nucleotides the chemicals which make up DNA

nucleus a subunit in the cell that contains genetic information

nucleus accumbens (NAcc) part of the mesolimbic system

nucleus of the solitary tract part of the medulla

nurture the influence of experience and/or culture on development

obedience carrying out orders given by somebody in authority

objective tests a type of personality test. One type is a paper-and-pencil test containing clear, specific questions, statements or concepts to which a person writes responses

obsessive-compulsive disorder (OCD) a category of anxiety disorder in which the main symptoms are either obsessions (uncontrollable thoughts) or compulsive rituals

occipital lobes also known as the visual cortex. The region of the cortex at the rear of the brain

olfaction perception of odours

olfactory epithelium tissue inside the nose involved in small perception

ontology the branch of philosophy that investigates what kinds of things exist

opaque languages languages like English where there are inconsistencies between the sounds of speech and the way these sounds are represented by letter(s)

operant conditioning a learning approach that is based on the positive and negative reinforcement of responses to stimuli

operation in the context of problem-solving, a term used by Newell and Simon (1961) to refer to the appropriate actions (mental or physical) which enable a problem-solver to move from state to state towards solution of the problem

operationism the philosophical approach that emphasises the need to use operational definitions – definitions of constructs in terms of the means by which they are measured – to investigate unobservable phenomena

opsins light sensitive receptors

optic chiasm the part of the brain where the optic nerves partially cross

optic nerve a nerve that transmits visual information from the retina to the brain

optical flow pattern the pattern of flow of objects in the world as the observer moves towards or away from a point on the horizon

optimistic bias the degree to which people believe that bad things will happen to other people (e.g. being involved in a car accident) rather than to themselves

orexin a neuropeptide released by the hypothalamus

organisation and memory a consistent observation that the way in which to-be-remembered material is organised, either in presentation or by the memorist, is crucial to its subsequent retrieval

organisational effects the processes that differentiate the body and brain

orthography a writing system

osmoreceptors receptors that detect changes in the concentration of the interstitial fluid

osmosis the diffusion of a solvent through a semi-permeable membrane from a region of low solute concentration to a region of high solute concentration

osmotic thirst a thirst that occurs when the solute concentration of extracellular fluid increases (see also **hypovolemic thirst**)

ossicles the three bones (malleus, incus and stapes) within the middle ear space and serve to transmit sounds

outgroup a group to which a person does not belong or thinks they do not belong

overlapping waves model Siegler's proposal that cognitive development involves different strategies and eventually one of these becomes dominant because it is the most effective

overt attention attention which is dependent on orienting responses and eye movements

pain an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage

pain anxiety a model of pain perception which argues that some individuals are fearful of pain, and as such have developed a phobia of pain that makes them hypervigilant for pain cues and anxious about these cues when they detect them

panic disorder a category of anxiety disorder characterised by repeated panic or anxiety attacks

papez circuit a major pathway of the limbic system, chiefly involved in the cortical control of emotion

paradigm a typical pattern or an example of something

parallel processing two or more sets of processes which occur simultaneously, as opposed to serially (one after the other)

parasuicide a collective name for potentially lethal self-harming or suicidal gestures, and risky behaviour that may result in death

parasympathetic nervous system part of the autonomic nervous system

paraventricular nucleus (PVN) a hypothalamic nucleus

parietal lobes cortical region behind the frontal lobes

parsing deriving the meaning from an analysis of the grammatical structure

partial agonists an agonist that activates a receptor, but not to its full efficacy

parvocellular layer a layer of cells in the lateral geniculate nucleus

pathology model approaches to psychopathology that view psychological problems as symptoms produced by an underlying cause

pattern recognition the process by which a particular pattern (implicitly two-dimensional) is recognised

peers children of approximately the same age

performance goals (also called ego-involvement goals) which focus on achieving normative-based standards, doing better than others, or doing well without a lot of effort

periaqueductal grey midbrain grey matter that is involved in pain perception

peripheral nervous system (PNS) outside the CNS, the peripheral nervous system is divided into the somatic nervous system and the autonomic nervous system

peripheral processing route persuasion processing that is characterised by a person not engaging in effortful issue-related thinking such as heuristic processing

peripheral traits from Asch's configural model of impression formation, that certain traits have an insignificant impact on the final impression formed about another person

permastore the idea that long-term memories are in a store from which information is never lost, analogous to the idea of permafrost in arctic and antarctic regions

person approach to human error the idea that human error is the responsibility of the person making the error, without regard for the systems in which that person is operating

person-positivity bias the general tendency to see other people as inherently good and as such to form a positive impression of them

personal self the total, essential or particular being of a person; the individual

personality disorders a category of psychopathology characterised by rigid and on-going patterns of thought and action (e.g. anti-social personality disorder). The inflexibility of the behavioural patterns found in personality disorders can cause serious personal and social difficulties, as well as a general impairment of functioning

persuasion attitude formation or change process. Occurs usually after exposure to arguments or other information about the attitude object

PGO waves a particular waveform of REM sleep which arise from the pons and go to the cortex. PGO stands for pons, geniculate and occipital cortex

phantom limb phenomenon a phenomenon in which individuals who have had a limb amputated still continue to report pain in the non-existent limb

pharmacodynamics the biochemical and physiological effects of drugs on the body

pharmacokinetics the factors influencing a drug as it travels through the body. Route of administration, rate of absorption and termination of the drug action are all important pharmacokinetic factors

phenotype the observed quality of an organism, such as its morphology, development, or behaviour (see also genotype)

phenylketonuria (PKU) an autosomal recessive genetic disorder that can cause problems with brain development, leading to progressive mental retardation

phonemes the smallest unit of sound in a language. The speech sound which distinguishes a word from other words

phoneme restoration effect the phenomenon in which a listener restores a phoneme which has been omitted or obscured to produce a meaningful perception

phonological awareness the ability to be able to identify the component sounds of a language and be able to manipulate these components

phonological encoding the coding of verbal information into memory in the form of the sounds of the words involved

phonological form that aspect of a word concerned with its sound

phonological loop a component of the working memory model which stores verbal material in phonological form

phonological (or indirect) route to reading the route to accessing the meaning of a word which converts the written form of a word to a pronunciation before using this pronunciation to access the word's meaning in the mental lexicon

photoreceptors light sensitive cells of the retina (rods and cones)

phrase structure the particular way in which a sentence breaks down to show how the words cluster together

physiological an approach to psychology that investigates the affects of brain operation and genetics on behaviour

physiological arousal it involves the activation of the reticular activating system in the brain stem, the autonomic nervous system and the endocrine system, leading to increased heart rate and blood pressure and a condition of sensory alertness, mobility and readiness to respond

physiological reductionism a form of reductionism that suggests that complex behaviour can be explained in terms of brain structure or genetics

pituitary gland a endocrine gland that secretes hormones

placebo effects a description of the fact that after receiving treatment for a psychological problem, many people will show improvement even though the therapy given was unstructured or the medication they received was inactive

pleasure principle the pleasure principle drives one to seek pleasure and to avoid pain

pluralistic ignorance the belief that one's attitudes and emotions are different from others while at the same time one's observable behaviour is the same as others

polarised during the resting potential, the neuron has two different charges on the inside and outside and is said to be polarised

polygraph a polygraph (commonly yet incorrectly referred to as a lie detector) is a device that measures and records several physiological variables such as blood pressure, pulse, respiration and skin conductivity

pons a brain stem structure

ponzo illusion an illusion in which two horizontal lines of equal length are seen as being of different lengths when they are superimposed on converging vertical lines

positional level the second stage in syntactic planning in speech production. At this stage, word order is specified

positive reinforcement when there is an increase in the likelihood of a behaviour due to the *addition* of a reinforcer after a behaviour

positive symptoms in schizophrenia the disturbed behaviours found in individuals diagnosed with schizophrenia that tend to reflect an excess or distortion of normal functions (e.g. developing inappropriate beliefs or perceiving things that are not there)

positivism non-critical acceptance that science is the only valid way to get true knowledge

positivity bias the tendency for people to evaluate individual human beings more positively than groups or impersonal objects

post-traumatic stress disorder (PTSD) a diagnostic category used to describe a set of persistent symptoms that occur after experiencing or witnessing a traumatic event such as combat during a war, rape or other types of criminal assault, child abuse, car or airplane crashes, or natural or human-caused disasters

practical intelligence the ability that individuals use to find the best fit between themselves and the demands of the environment

predictive validity the degree to which test scores indicate a result on a specific measure that is consistent with some other criterion of the characteristic being assessed. The extent to which you can make hypothesis about the animal model in response to an intervention (see also face validity and construct validity)

prejudice derogatory attitudes towards a social group or members of that group

primacy effect that information presented earlier will have a greater influence than later information on a person's judgements of other people or issues, e.g. that the first item on a list is remembered better than the following items

primary appraisal in transactional models of stress and coping, an appraisal of the potency of a stressor

priming paradigm a research approach that activates particular schemas or representations in memory for use when other consistent stimuli are encountered

priming task a task which seeks to facilitate or inhibit the response to a word by presenting a related word immediately before it

principles and parameters theory (PPT) a theory put forward by Chomsky and his colleagues which supposes that language acquisition involves innate structures

pro-social behaviour any actions that are thought of as positive by society. See also helping and altruism

proactive interference the observation that information acquired at time T1 impedes the retrieval of similar information acquired at time T2, often by intrusion

procedural memory memory for procedures or skills

procedural stage of skills acquisition the intermediate stage of skills acquisition in which knowledge of what needs to be learned is converted into a set of procedures or production rules

productive strategy a term in Gestalt psychology which refers to producing a solution which is appropriate to the problem and which is created and arrived at through insight. To be contrasted with a reproductive strategy

projective tests a method of personality assessment in which an individual is presented with a standardised set of ambiguous, abstract stimuli and asked to interpret their meanings; the individual's responses are assumed to reveal inner feelings, motives and conflicts

protein hormones hormones that influence the function of previously made proteins

prototype cognitive representation of the typical or ideal features of a specific category

prototype model of semantic memory the idea that concepts stored in memory are stored in the form of prototypes of those concepts

proximal stimulus the stimulus that falls on the retina

proximity principle a Gestalt principle underpinning the law of pragnanz in which lines which are close together are seen as belonging together

Prozac the brand name for fluoxetine, a selective serotonin reuptake inhibitor (SSRI) that is used as a treatment for symptoms of depression

psychiatry the profession whose approach to psychopathology is based on medicine. Psychiatry attempts to identify the biological causes of psychopathology and its main aim is to treat these causes with medication or surgery

psychoanalysis the theory developed by Freud which suggests that personality and behaviour are determined by unconscious impulses

psychodynamic a psychological model in which behaviour is explained in terms of past experiences and motivational forces; actions are viewed as stemming from inherited instincts, biological drives, and attempts to resolve conflicts between personal needs and social requirements

psychopathology the study of deviations from normal or everyday behavioural and psychological functioning

psychophysics a sub-discipline of perception which seeks to map changes in the physical stimulus to changes in the psychological stimulus

psychosomatic illness physical illness that is affected by psychological factors (e.g. stress can make you more susceptible to picking up infectious illnesses by affecting your immune system)

punishment a stimulus which *decreases* the likelihood of a particular behaviour

pyramidal motor system a motor system that controls fine movement

randomised controlled trials (RCTs) a method for assessing the effectiveness of a treatment or therapy by comparing its effectiveness against a number of different control conditions

rational-emotive therapy (RET) a form of cognitive therapy developed by Albert Ellis (1962)

realistic conflict theory Sherif's account of intergroup conflict based on the nature of goal relations between groups

reality principle the reality principle strives to satisfy the id's desires in realistic and socially appropriate ways

recency effect that information presented later will have a greater influence than earlier information on a person's judgements of other people or issues, e.g. that the last item on a list will be remembered better than the preceding items

reception paradigm of concept learning an experimental procedure in concept learning in which the passive learner is presented with examples or non-examples of the concept with a view to learning the concept

receptive field the zone which when stimulated activates a given detector, usually applied to the firing of single cells

receptors proteins to which chemicals attach themselves and bring about cellular changes

recessive trait a phenotype when there are two recessive alleles in the organism (see Phenylketonuria for example)

reciprocal inhibition in behaviour therapy, a therapeutic principle in which an emotional response is eliminated not just by extinguishing the relationship between the CS and the UCS, but also by attaching a response to the CS which in incompatible with anxiety (e.g. relaxation)

recognition by components theory a theory put forward by Biederman (1987) which argues that objects are recognised on the basis of the combinations of geons of which they are composed

red nucleus a midbrain area involved in motor behaviour

reductionism a philosophical approach to understanding the nature of complex entities (e.g. the brain) by reducing them to the interactions of their parts, simpler or more fundamental entities

reduction mnemonics memory techniques which reduce the to-be-remembered information to simple retrieval cues from which the original material can be retrieved

reductionism the general view that complex wholes (e.g. the brain) are best explained by investigating simpler, constituent parts and the interactions of the parts. The opposing view, that we must explain the whole as a single entity, is called holism

reductionist a procedure or theory that reduces complex data and phenomena to simple terms

reference group a group that is psychologically significant for members' beliefs and attitudes

referent informational influence an influence type characterised by conformity to a self-referent group norm that defines oneself as a group member

reflected appraisal a process where we imagine how other people see us

reflex an automatic or involuntary neuromuscular action elicited by a defined stimulus (an unconditioned response)

reflexive discourse a general term to describe discussion and theorising about human nature and behaviour. Psychology is one form of reflexive discourse, as are philosophy and theology

rehearsal the technique which involves repeating to-be-remembered information continuously, overtly or covertly, with a view to remembering it

reinforcement a consistent relationship between a response and the changes in the environment that it produces; an increase in the strength of the response following the presentation of a stimulus contingent on that response

reinforcement-affect model a model of attraction that says we come to like people who are with us when we have a positive experience. The experience is gauged in terms of feelings and emotions

relational self the tendency to define ourselves in terms of our close relationships/roles with others

relative refractory period a period after an action potential in which a stimulus has to be of greater strength to produce another action potential

reliability the degree to which a test produces similar scores each time it is used; stability or consistency of the scores produced by an instrument

REM sleep a stage of sleep characterised by rapid movements of the eyes

reminiscence bump the observation that autobiographical memories recalled by older participants are particularly good for memories acquired in the twenties, attributed to a tendency to reminisce about this time of life

rennin an enzyme which activates angiotensin

repisodes episodes which are repeated and may become habitual, e.g. weekly lectures for students

representational redescription a model proposed by

Karmiloff-Smith that cognitive development involves a progression from implicit to explicit representations

representativeness heuristic the cognitive tool used to allocate attributes to another person on the basis that they match a prototype of a category; the idea that we base our judgement more on a subjective impression of how representative an instance is of a particular phenomenon than on objective information

reproductive strategy in the context of problem solving, a strategy which applies past solutions to the current problem

research ethics ethical research is research that shows concern for the welfare and well-being of participants, protecting them from physical and psychological harm

resilience developing in a typical manner despite adverse circumstances

response shaping a form of treatment based on operant conditioning principles in which successive approximations to the desired behaviour are reinforced in a step-by-step manner

resting potential the polarised state of a neuron that is not in the process of an action potential

restructuring (of a problem) the process in Gestalt problem-solving theory which underpins the insight that leads to the problem being solved

retention function the observation in autobiographic recall that the number of memories recalled decreases rapidly from the most recent

reticular formation one of the oldest parts of the brain. Involved in many behaviours, including sleep

retina the thin layer of neural cells that lines the back of the eye and contains photosensitive cells

retinal disparity the difference in images seen by the two eyes when they focus on a given object. The closer the object, the greater the difference. Thus the degree of disparity is a cue to distance or depth

retinal ganglion cells cells that receive information from photoreceptors in the retina

retinal size the size of the image cast on the retina by an object

retrieval processes the processes in memory responsible for remembering past information

retrieval cue a cue or hint which helps with the retrieval of information from memory

retroactive interference the observation that a recent memory can impede the retrieval of an earlier similar memory, often by intrusion

retrograde amnesia memory loss for events or information that predate the event that precipitated the memory loss. Contrast with **anterograde amnesia**

retrograde signalling where a signal travels from a postsynaptic neuron to a presynaptic one

reversibility Piaget used the term to refer to a general understanding of the nature of transformations, for example, the understanding that volume and mass remain the same despite changes in shape

rhodopsin light-sensitive pigment

ribosomes ribosomes read the sequence of mRNA and add amino acids as the codons instruct

Ringlemann effect reduction in individual effort by group members with increasing group size

risk factors factors that have been found to increase the risk of the subsequent onset of a psychopathology

rule-based processes in human error processes involving procedures or rules and which form a potential basis for human error

saccule part of the inner ear and vestibular system

salutatory conduction the conduction of an impulse down a myelinated axon

satellite cells support cells in the peripheral nervous system

savant syndrome an individual with a rare form of mental retardation, extraordinarily talented in one or a few limited areas of intellectual development

scaffolding the support given to a learner by structuring the problem so that they can succeed

scene a type of schema about the content and layout of places

schema cognitive structure that represents knowledge about a stimulus or concept, including its attributes and the relations between those attributes, in an organised packet stored in long-term memory. Also Piaget's term for an element of thought that concerns a topic

schemata in the context of expertise, the form in which an expert's knowledge is stored

schizophrenia a severe psychopathology characterised by a collection of disparate symptoms comprising cognitive and emotional dysfunctions that include dysfunctions of perception, inferential thinking, language and communication, behavioural monitoring, affect, fluency, productivity of thought and speech, and attention

scientific racism a political movement that attempts to find a scientific justification for racial differences and inequalities

script a type of schema. A timetable of key events in common situations such as going to a lecture and travelling to work.

secondary appraisal in transactional models of stress and coping, an appraisal of the coping resources an individual has available to deal with a problem

security of attachment often used to refer to the different types of attachment relationship identified in the strange situation

selection paradigm of concept learning an experimental procedure in concept learning in which the learner actively selects what s/he considers to be examples or non-examples of the concept with a view to learning the concept

selective serotonin reuptake inhibitors (SSRIs) the collective name for a group of antidepressant drugs that selectively affect the uptake of only one brain neurotransmitter – usually serotonin

self-actualisation a concept in personality psychology referring to a person's constant striving to realise his or her potential and to develop inherent talents and capabilities

self-categorisation process the process by which categorisation of oneself as a group member produces social identity and intergroup behaviour

self-concept one's concept or idea of oneself in the social world

self-efficacy the set of beliefs that one can perform adequately in a particular situation

self-esteem a generalised evaluative attitude toward the self that influences both moods and behaviour and that exerts a powerful effect on a range of personal and social behaviours

self-handicapping hurdles the tendency to construct the conditions under which failure is inevitable but not one's fault

self-perception an awareness of the characteristics that constitute one's self; self-knowledge

self-perception theory Bem's theory as an alternative to cognitive dissonance. States that a person infers their own attitudes by using attributional reasoning like an outside observer does

self-report questionnaires the self-behaviours that are identified through a participant's own observations and reports

self-schema any mental structure representing knowledge about oneself on a particular dimension or in a particular domain

self-serving biases types of distortions in attribution to maintain self-concept and self-esteem. People attribute success to internal causes and failure to external cause

semantic differential scale a technique for measuring attitudes. People rate attitude objects on a series of bi-polar adjective scales

semantic encoding the coding of information into memory based on the meaning of the material involved

semantic memory the memory system posited to store information about meanings of words, concepts and facts about the world

semantic priming the observation that the processing of a stimulus is enhanced if the participant has recently processed another, semantically related stimulus

semanticity in the context of the design characteristics of language, the fact that words in a language have a meaning and stand for something

semicircular canals part of the vestibular system

sensation the psychological effect of the quality of the stimulation intensity, wavelength, duration

sensation seeking the process in which the individual actively seeks out stimulation from the environment

sensitivity (d') the parameter in signal detection theory which reflects the participant's sensitivity to the signal

sensorimotor the first of Piaget's stages, which involves thinking based on sensation and motor movement

sensory memory a high-capacity memory which holds sensory information for very short periods of time. Includes **iconic memory** and **echoic memory**

sensory threshold the level of stimulation required to produce a sensation

serial position effect the observation that the probability of recall of an item in a list is related to the position of the item in the list. Initial and recent items are remembered best

serial processing two or more sets of processes which occur serially (one after the other), as opposed to simultaneously (in parallel)

serial recall a memory paradigm in which items have to be remembered in the order in which they were presented

sexual motivation an inferred, internal state, influenced by several factors, which determines engagement in sexual activity

shadowing a term used to denote the participant's on-line repetition of one message in a dichotic listening task

shape constancy the tendency to perceive an object as being of a fixed size in spite of actual changes in the shape of the projection on the retina caused by looking at the object from different angles

shaping the systematic training and refinement of behaviour by reinforcing desired behaviours in order to reach a goal behaviour

short-term memory a memory system which holds small amounts of information for a short time in the absence of rehearsal

siblings brothers and sisters

signal detection theory a mathematical model which specifies a participant's response to a signal in terms of his/her sensory sensitivity to the signal and his/her threshold for deciding to respond

similarity principle a Gestalt principle underpinning the law of pragnanz in which patterns which are similar in appearance are seen as belonging together

simple cells cells in the visual cortex which respond to straight line segments in a particular area of the retina

situational causes causes of behaviour to do with things external to the person being perceived such group pressure, social norms and context

size constancy the tendency to perceive an object as being of a fixed size in spite of actual changes in the size of the image which result from distance from the observer

size-distance invariance hypothesis the idea that for a given retinal size the perceived size is proportional to the perceived distance

skilled processes in human error processes which are highly practised and routinised and which form the basis of particular kinds of human error

sleep spindles a burst of electrical activity during sleep

social cognition cognitive processes and structures that are influenced by social behaviour

social comparison comparing one's own opinions and behaviour with others so as to understand the socially approved way of thinking about things or behaving

social compensation the process of increased effort on a group task so as to compensate for other members' perceived lack of effort or ability on the task

social constructionism an approach to psychology that emphasises the way in which humans construct reality through language and interactions with others

social desirability this bias can occur when researchers use self-report methods, such as interviews and questionnaires. It is the tendency of respondents to provide socially desirable answers so that the respondent appears in a better light

social exchange theory liking or disliking for people is based on the rewards they exchange with others in interaction. See also cost-reward ratio

social facilitation the tendency of people to perform better on well-learned/easy tasks and more poorly on novel/difficult tasks when in the presence of others

social goals what one wishes to accomplish in a social situation

social identity the part of self-concept that develops as a result of one's group membership

social identity theory social identity theory proposes that the membership of social groups and categories forms an important part of our self-concept. Therefore when an individual is interacting with another person, they will not act as a single individual but as a representative of a whole group or category of people

social influence the process in which the attitudes, beliefs and behaviours of people are influence by the actual or imagined presence of others

social impact theory describes how factors like group pressure, proximity and immediacy affect people's attitudes, beliefs and behaviours

social learning theory Bandura's idea that social behaviour is learned by observing and imitating the behaviours of others and also by receiving reinforcement for their own social behaviours. See also modelling

social loafing the tendency for reduced effort by individuals working on a collective task for all members receive reward compared to individual performance

social norms the expectation a group has for its members regarding acceptable and appropriate attitudes and behaviours

social psychology the study of how people think about, influence and relate to one another

social self the idea that the self is produced through interaction with two or more people

socially constructed any institutionalised entity or artifact in a social system 'invented' or 'constructed' by participants in a particular culture or society that exists because people agree to behave as if it exists or follow certain conventional rules. One example of a social construct is social status

sodium-potassium pump an energy-consuming mechanism, which pumps Na^+ out, and K^+ in to the cell to maintain the resting potential

soft determinism soft determinism is an intermediate position between free will and determinism that suggests that the underlying causes of behaviour are inaccessible, and that we should therefore assume that people are able to exert control over behaviour

soma also called cell body. Contains the nucleus and mitochondria

somatic nervous system (SNS) the part of the peripheral nervous system which interacts with the external environment

somatic theory of emotion the view that that emotional experience is largely due to the experience of bodily changes in our physiological arousal

somatogenic hypothesis an approach to psychopathology that advocates that the explanation of psychopathology can be found in physical or biological impairments

somatosensation perception of touch, temperature, pressure, pain

spatial frequency theory a theory of visual perception that cells work on the number of light/dark cycles in a stimulus

spatial intelligence involves the potential to recognise and use the patterns of wide space and more confined areas

spatial summation the integration of neural information coming in from different sites

specific language impairment a specific learning disability that involves language

specific phobia in psychopathology, an unreasonable fear of a particular situation or object

speech perception the processes by which we hear speech as a stream of coherent sounds

speed tests tests that require you to give answers within a given time limit or in the shortest time span

spinoreticular pathway a pathway of the anterior lateral system involved in pain perception, via the thalamus

spinotectal pathway a pathway of the anterior lateral system involved in pain perception

spinothalamic pathway a pathway of the anterior lateral system involved in pain perception, via the thalamus

spontaneous processing that type of cognitive processing that a person is not aware of and does not have control over

spontaneous recovery the reemergence of a conditioned response after the conditioning stimulus has been extinguished

spontaneous remission describes the fact that some people with symptoms of psychopathology recover spontaneously from these symptoms without any structured treatment

spontaneous usage a design characteristic of language the free use of language to express thoughts and feelings which comes from within the person and is not just in response to someone else

spoonerisms a speech error in which sounds are exchanged

spreading activation model of semantic memory a network model of memory in which the stimulation of a node produces a pattern of activation in semantically related nodes with the degree of activation decreasing with semantic distance from the activated node

stages of development in psychoanalytic theory, these represent the four stages of development (the oral stage, the anal stage, the Oedipal or Electra stage and the Latency stage) which a child must successfully negotiate to become a psychologically healthy individual

standardisation a set of uniform procedures for treating each participant in a test, interview or experiment or for recording data

state-dependent memory a variant of context-dependent memory in which the person's mental state plays the role of context. That is, information acquired in a given state, such as drunkenness, is best recalled when in the same mental state

stereotypes widely shared and simplified set of beliefs about a social group and its members

steroid hormones hormones which gain entry to the inside of a cell and, once inside, the steroid acts as a receptor and binds to the DNA

storm and stress often used to refer to adolescence as an especially difficult period in the lifespan

stranding error a speech error in which components of a word are left stranded while the main word is exchanged

strange situation a laboratory-based procedure developed by Ainsworth and Bell (1969) to assess an infant's security of attachment

stress stress can be defined in a number of ways, including (1) as external or environmental forces that create a stressful reaction (e.g. difficulties at work), (2) as something experienced by the individual (e.g. feelings of tension or pressure) and (3) as a physiological reaction that affects the autonomic nervous system (ANS), causing changes in arousal, hormone secretion and general physiological alertness

striatum a subcortical part of the telencephalon. It is the major input station of the basal ganglia system and is divided into the caudate nucleus and the putamen

structure dependence in the context of the design characteristics of language, the fact that words in a language combine to convey meaning in ways that are governed by rules

subarachnoid space the interval between the arachnoid mater and pia mater

subfornical organ a region of the fornix involved in thirst

subgoals milestones on the road to solving a problem which are the product of a means-end analysis

subjective validation effect sometimes called the 'personal validation effect' because it refers to a process by which people accept some claim or phenomenon as valid based solely upon a few personal experiences and/or subjective perception

substantia nigra part of the basal ganglia

sufficiency principle a factor in the heuristic systematic processing model. States that people desire sufficient confidence in their attitudinal judgements. When their actual confidence is lower than their desired confidence (or sufficiency threshold) they will process information in order to close the gap

sulci the visible troughs in the cortex

sunk cost effect the observation, related to loss aversion, that a person will continue to invest time, money and effort in something even when it is clear that they are wasting their investment

superego in psychoanalytic theory, a third psychic structure caused by extensive interaction with the world that enables the individual to internalise principles related to social norms and values

superior colliculi part of the midbrain involved in visual perception

superior olivary nuclei brainstem nuclei involved in auditory perception

superordinate goals goals that are desired by a number of groups but can only be achieved by the groups cooperating with each other

supplementary motor area (SMA) part of the sensorimotor cortex

Sympathetic nervous system Part of the autonomic nervous system the SNS is an activating system (involved in fight/flight responses)

symptoms in psychopathology, the manifestation of behavioural or psychological problems that are an indication of a diagnosable psychological disorder

synapse junction at which cells communicate with each other

synaptogenesis the formation of synapses

syntactic planning the second major process of formulation in speech production, in which the grammatical structure of the sentence is planned

systematic desensitisation a form of behaviour therapy that uses graduated exposure to the individual's anxiety provoking stimuli or situations

systems approach to human error the idea that human error is substantially the product of the systems and procedures in which the person is operating

telencephalon part of the forebrain. Made up of the two cerebral hemispheres containing the cortex, the basal ganglia and the limbic system

template matching theory the idea that we recognise a pattern by matching the percept with templates stored in memory until a match is found

temporal lobes part of the cortex that lies at the sides of the brain and contains the hippocampus

temporal summation when the incoming information is close together in time and there is an increased change of response in a particular direction. In the case of a barrage EPSP, an axon potential will be initiated

teratogens a substance or agent which can affect the development of an unborn child, e.g. radiation, pollution

test-retest reliability a measure of the correlation between the scores of the same people on the same test given on two different occasions

texture gradient the change in the texture of a surface with distance from the observer

thalamus part of the diencephalon. Involved in numerous functions

theory of mind (TOM) to understand that others have beliefs, desires and intentions that are different from one's own

theory of planned behaviour Ajzen's extension of the **theory of reasoned action**. States that the immediate antecedent of actual behaviour is behavioural intention. This being the case, behavioural intention is predicted by perceived behavioural control, attitude and subjective norm

theory of reasoned action Fishbein and Ajzen's theory that the immediate antecedent of actual behaviour is behavioural intention. Behavioural intention is predicted by attitude and subjective norm

thinking a broad term which refers to problem-solving, making judgements, decision-making and reasoning

tip of the tongue phenomenon a mental state in which a person is unable to produce a word they want but feels that it is on the tip of their tongue

token economy a group therapy procedure based on positive reinforcement in which desired behaviours are reinforced with tokens that the individual can later exchange for desired items

traits enduring personal qualities or attributes that influence behaviour across situations. In biology, characteristic variations, e.g. eye colour

transactional model of stress a model of stress and coping developed by Lazarus (1975) in which an individual first appraises a stressor as either benign or threatening, and if it is believed to be threatening, then assesses the various coping resources they have available, and decides on the best way to deal with the stressor

transcription the process of copying DNA to RNA

transfer RNA (tRNA) a molecule which transfers a specific amino acids to a growing polypeptide chain at the ribosomal site of protein synthesis

transference in psychoanalytic therapy, a procedure in which the analyst is used as a target for emotional responses, and the client behaves or feels towards the analyst as they would have behaved towards an important person in their lives

transgenic mice a genetically modified mouse, but could refer to other organisms as well

triadic relations in relation to infancy, the joint attention of an adult and infant to an object or event

triangular model of love Sternberg's idea of three interacting aspects of love intimacy, commitment and passion

triarchic theory the triarchic theory of intelligence consists of three sub-theories (1) the componential sub-theory which outlines the structures and mechanisms that underlie intelligent behaviour categorised as metacognitive, performance or knowledge acquisition components, (2) the experiential sub-theory that proposes intelligent behaviour be interpreted along a continuum of experience from novel to highly familiar tasks/situations, (3) the contextual sub-theory which specifies that intelligent behaviour is defined by the sociocultural context in which it takes place and involves adaptation to the environment, selection of better environments and shaping of the present environment

tricyclic antidepressants a group of drugs used to treat symptoms of depression that have their effect by increasing the amount of norepinephrine and serotonin available for synaptic transmission in the brain

top-down processing the perceptual processing of a visual (or other object) which is driven by context, expectation or knowledge

trace decay the idea that forgetting occurs because memory traces decay with time, in a manner analogous to radioactive decay

transparent languages languages where there is a consistent relation between the sounds of speech and the way these sounds are represented by letters

Treisman's attenuation model the idea that although all auditory inputs are processed all but the selected input are attenuated or 'softened'

trial and error strategy a problem-solving strategy which relies on random behaviour until the solution is found. On subsequent trials, the randomness decreases as the appropriate solution is learnt

two-factor theory of emotion the theory that emotional experience is a combination of both physiological arousal and cognitive appraisal of an arousing situation. The arousal acts as a volume (high-low) to emotional experience, while the appraisal adds meaning (fear, sadness, etc.) to the experience

typicality effect the experimental observation that it is quicker to decide that a typical member of a category is a member of the category than an atypical member. Thus it is quicker to decide that a Labrador is a dog than that a Chihuahua

ultimate attribution error the tendency for people to make attributions for their in-group that serve to protect and enhance group membership, and also make more deprecating attributions for the behaviour of out-groups

unconditional positive regard in client-centred therapy, a process by which the therapist values the client for who they are and refrains from judging them

unconditioned response (UCR) Pavlovian conditioning term. The reflexive response to an unconditioned stimulus (see also **conditioned stimulus**, **unconditioned stimulus** and **conditioned response**)

unconditioned stimulus (UCS) Pavlovian conditioning term. A stimulus that produces a reflexive response stimulus (see also **conditioned stimulus**, **unconditioned response** and **conditioned response**)

uni-dimensional approach an approach to understanding the concept of attitude that focuses on the central role of affective or emotional evaluation of an object, person or issue

unilateral visual neglect a neuropsychological impairment which presents as a tendency to neglect or ignore visual inputs from one half of visual space

universal grammar the innate linguistic rules which are supposed to be possessed by all children and enable them to acquire language

utricle part of the inner ear and vestibular system

valid conclusion the conclusion that follows inevitably from the premises and the application of logic

validity a general term referring to the extent to which a study investigates what it purports to measure. Internal validity refers to the extent to which a study correctly tests the intended predictions. External validity refers to the extent to which the results of a study can be generalised to real world situations

variable interval schedules (VI) in operant conditioning, when a reinforcer is delivered after a varied interval around an average time if a response has been made

variable ratio schedule (VR) in operant conditioning, when a reinforcer is delivered after a varied number of responses around an average

vascular theory of emotion the suggestion that changes in facial expressions influence the blood vessels that regulate brain temperature. Increases in brain temperature are associated with negative emotions and decreases with positive ones

vasopressin antidiuretic hormone. Reduces the amount of fluid going to the bladder and conserves water
ventral tegmental area (VTA) part of the mesolimbic system
ventromedial hypothalamus (VMH) part of the hypothalamus involved in feeding behaviour
verb-island hypothesis the suggestion that children have difficulty working out that different verbs follow the same grammatical rules
verbal memory the memory system or systems which deal with language-based material
vesicles a small intracellular, membrane-enclosed sac that stores and/or transports neurotransmitter substance
vigilance an attentional state in which a person is waiting for an indefinite period of time to detect an event or signal
visual illusions visual percepts which are systematically inaccurate representations of the distal stimulus
visual (or direct) route to reading the route to accessing the meaning of a word which uses the written form to directly access the word's meaning in the mental lexicon
visual search an experimental technique in which the participant is required to search for a particular target in an array of potential targets
visual sensory memory see **iconic memory**
visuospatial scratchpad the component of working memory which deals with visual and spatial information
Völkerpsychologie the study of the collective mind. Early precursor to social psychology from Germany in the 1860s
vulnerability factors factors that make an individual susceptible to the development of a psychopathology (e.g. childhood abuse and neglect is a vulnerability factor for many later life psychopathologies)
Wechsler intelligence scales an individual, standardised test of intelligence devised by the psychologist, David Wechsler
wholist strategy (of concept learning) strategy in which concept learners try to remember the characteristics of all positive instances of the concept to formulate an appropriate hypothesis
word frequency the (estimated) frequency with which a word occurs in the language
word superiority effect an experimental result in which recognition of a letter in a word is better than its recognition on its own or in a random string of letters
working memory model the model of memory posited by Baddeley and Hitch (1974) consisting of a central executive, a phonological loop and a visuospatial scratchpad
worried well individuals who visit their GPs for a consultation at the slightest opportunity or with the most minor of symptoms
worrying an anxiety-related cognitive activity that forms the cardinal diagnostic symptom of generalised anxiety disorder (GAD)
wrap-up the process in sentence processing whereby meaning is extracted and the corresponding form discarded
zone of proximal development the area of functioning where a person can succeed in a task with the help from others
zoom lens model the idea that the scope of visual attention can be narrowed or widened in a manner analogous to the action of a zoom lens

Glossary of research methods terminology

α-level the probability of making a **Type I error** (usually this value is 0.05)
alternative (experimental) hypothesis the prediction that your experimental manipulation will have some effect or that certain variables will relate to each other
analysis of variance (ANOVA) a statistical procedure that uses the *F*-ratio to test the overall fit of a linear model. In experimental research, this linear model tends to be defined in terms of group means and the resulting ANOVA is therefore an overall test of whether group means differ. In correlational research, the linear model can consist of one or more predictors and the resulting ANOVA is therefore a test of whether the one or more predictors explain a significant proportion of the variance in the outcome variable
assumptions the conditions under which a **test statistic** can be assumed to be accurate

bar chart a graph displaying some statistical property (**frequency**, **mean**, etc.) of an **outcome variable**, for unordered categories of data. The statistical property is displayed as a bar (see Figure 38.8)
between-group design see **independent measures design**
bimodal a set of data is said to be bimodal if there are two values of the **mode**
boredom effects the possibility that performance at the end of a series of tasks, or one long task, is influenced by boredom
boxplot a boxplot, or box-whisker diagram, is a graphical representation of the **median**, **interquartile range** and **range** of a set of observations (see Figure 38.10 for an example)
box whisker diagram see **boxplot**

case study an in-depth study of either one entity (an individual, organisation or whatever) or a small number of entities
categorical variable see **discrete variable**
central tendency a generic term describing the centre of a **frequency distribution** of observations as measured by the **mean**, **mode** and **median**
chartjunk superfluous material which distracts from the data being displayed on a graph
chi-square test a test based on the chi-square distribution, which is a probability distribution of the sum of squares of several normally-distributed variables. The exact shape of the distribution is determined by the **degrees of freedom** of the test statistic for which the distribution is being used. The chi-square test tends to be used to test hypotheses about categorical data, for example whether there is a significant association between the frequencies of responses across two **categorical variables**
cluster sampling a cluster sample takes a naturally occurring group (for example, children in a class or all general practitioners in Brighton)

coefficient of determination this is the correlation coefficient squared. In general terms it is the correlation between the values predicted by a regression model and the observed values and represents the amount of variance in the outcome variable, accounted for by the one or more predictors in the model

confidence interval boundaries that are estimated so that in a certain percentage of samples (usually 95%) the population mean will fall within these boundaries

confounding variable a variable (that may or may not have been measured) other than the predictor variables in which we're interested that potentially affects an outcome variable

content validity evidence that the content of a test corresponds to the content of the construct it was designed to cover

continuous variables any variable made up of categories or groups of objects/entities

control condition a group in an experimental design in which the proposed cause of an effect is absent

correlation Pearson's correlation coefficient is a standardised measure of the relationship between two variables

correlational research see cross-sectional research

counterbalancing in an experiment, counterbalancing is a technique used to ensure that order effects such as practice and boredom do not affect performance systematically. As many participants experience the conditions in one order as experience them in the opposite order e.g. with two conditions, half the participants perform the conditions in the order AB, and half in the order BA

criterion validity evidence that test scores predict, or correspond with, concurrent external criteria that are conceptually related to the measured construct

Cronbach's alpha a measure of the reliability of a scale. A value of 0.7-0.8 is regarded as an acceptable value for scale reliability for social science data although values below 0.7 can, realistically, be expected

cross-sectional design an experimental design widely used in developmental research. Separate groups of participants are used to represent different levels of an independent variable which would ideally be represented by a single group at different times. For example, in studying age-differences, a cross-sectional design would involve using different groups of participants to represent different ages, rather than measuring the behaviour of a single group at different ages

cross-sectional research in psychological terms it is research in which naturally occurring behaviour/cognitions/physiological responses are measured or observed without trying to influence those responses by manipulating other variables (see correlational research)

deception deliberately misleading participants about the purpose of the research (or some part of it) in which they are engaged

degrees of freedom the number of items that are free to vary when calculating a statistic

demand characteristic when a participant attempts to perform the task in the manner in which they think the experimenter would wish, they are responding to the demand characteristics of the study

dependent *t*-test a test of whether the difference between two means is different from zero, when the means come from the same sample of people (usually tested under two different conditions)

dependent variable synonym for outcome variable. This name is usually associated with experimental methodology (which is the only time it really makes sense) and is so-called because it is the variable that is not manipulated by the experimenter and so its value depends on the variables that have been manipulated

deviation the difference between the observed value of a variable and the value of that variable predicted by a statistical model. For example, the deviation of an observation from the mean is simply the observed value minus the mean of all observations

discourse analysis operates on the basic assumption that by studying what we say (and how we interact) we can gain access to psychological processes. The starting point for a discourse analysis could be a transcribed individual interview (which has an advantage of control) or a group discussion (which has the advantage that you can look at natural interactions)

discrete variable a variable having only integer values (contrast with continuous variable)

ecological validity evidence that the results of a study, experiment or test can be applied, and allow inferences, to real world conditions

effect size an objective and (usually) standardised measure of the magnitude of an observed effect. Examples include Cohen's, d, Pearson's correlation coefficient, *r* and odds ratios

error bars error bars are used to indicate how much variation is associated with each data point on a graph. Error bars can denote different types of variation such as the standard deviation, standard error or a confidence interval

experimental hypothesis see alternative hypothesis

experimental research in psychological terms, research in which variables are systematically manipulated to see their effect on naturally occurring behaviour/cognitions/physiological responses

extraneous variables any variable, measured or otherwise, that is not the primary predictor variable of interest that has an influence over the outcome variable

fit how well a statistical model describes the data collected

frequency distribution a frequency distribution shows how often each of a range of scores or things occurs. In the case of categorical data, a frequency distribution shows how often each category occurred

Friedman's ANOVA a test of whether three or more conditions differ when data across those conditions is related (e.g. the same participants have been tested in all conditions) that can be used when the assumptions underlying one-way repeated measures ANOVA have not been met

grounded theory a research method in which the analysis of qualitative data informs the development of a theory rather than vice versa

histogram a graphical display of a frequency distribution (see Figure 38.7 for examples)

homogeneity of variance the assumption that the variance of one variable is stable at all levels of another variable. If your predictor variable is categorical then this means that the variance of your outcome variable or variables should be the same in each of these categories or groups. If data are continuous data (such as in correlational designs), this assumption means that the variance of one variable should be the same for all values of the other variable

hypothesis a testable statement, derived from theory, which is used to test that theory

idiographic developing knowledge on a case-by-case basis (contrast with nomothetic)

independence generally speaking, entities are independent if they have no effect on each other

independent measures design an experimental design in which different participants are allocated to different treatment conditions

independent *t*-test a test of whether the difference between two means is different from zero, when the means come from different samples of people (usually tested under two different conditions)

independent variable a variable the values of which are systematically determined by a researcher to address a specific hypothesis. A predictor variable

informed consent the act of obtaining consent for research participation after full disclosure of the research (or at least disclosure of any details that might reasonably make someone unwilling to participate)

interquartile range the range of a set of observations when you ignore the upper quartile and lower quartile of the data

interval data data measured on a scale along the whole of which intervals are equal

Kruskal-Wallis test a test of whether three or more conditions differ when data across those conditions are independent (e.g. the same participants have been tested in all conditions) that can be used when the assumptions underlying one-way independent ANOVA have not been met

kurtosis the degree to which scores cluster in the tails of a frequency distribution (see leptokurtic and platykurtic)

Latin square counterbalancing a form of experimental design aimed at eliminating order and practice effects by adjusting the order in which different groups of participants undergo different treatments. If there are three experimental conditions, A, B and C, you would require three groups who did the tasks in the following orders ABC, CAB, BCA. Note that each task appears once in each temporal location across the groups

leptokurtic a distribution of scores that has relatively few scores at the extremes. These distributions tend to look pointy (see Figure 38.4)

levels the categories of a categorical variable are often referred to as *levels* (especially when these categories are determined as part of an experimental manipulation). For example, an experiment that compares a drug intervention with a placebo is said to have one variable (type of drug) with two levels. If we added a condition in which an alternative drug was used, there would still be one variable (type of drug) but it would now have three levels placebo, drug A and drug B

levels of measurement the relationship between what is being measured and the numbers obtained on a scale

line chart a graph displaying some statistical property (e.g. the mean) of an outcome variable, for unordered categories of data. The statistical property is displayed as a symbol, and related values are connected with a line (see Figure 38.9)

line of best fit when scores have been collected on two variables, the straight line that when fitted to these scores produces the least error. It's worth noting that even though it is the line of best fit, it doesn't necessarily mean that it is a good fit, just that it's better than any other straight line that could have been fitted

lower quartile the value in a set of ordered observations that splits the lowest 25% of scores

Mann-Whitney test a test of whether scores from two independent samples differ. It can be used in place of the independent *t*-test when its assumptions have not been met

matched design an experimental design involving different groups of entities that have been matched to control for extraneous variables. An example would be two groups of people in which each person in one group has a corresponding person in the second group who has an identical IQ score

mean the average of a set of observations. It is the sum of all scores divided by the number of scores

measurement error the discrepancy between the numbers used to represent the thing that we're measuring and the actual value of the thing we're measuring (i.e. the value we would get if we could measure it directly)

median the middle score (if there are an odd number of scores) or the average of the two middle scores (if there are an even number of scores) in a set of scores ordered by their magnitude

mixed design An experimental design using at least two predictor variables, at least one of which is measured using different participants and at least one of which is measured using the same participants

mixed-plot design see mixed design

mode the most frequent score in a set of observations

multimodal a set of data is said to be multimodal if there are more than two values of the mode

negative skew a property of a distribution of scores indicating that scores cluster at the higher end and the distribution tails off towards the lower scores (see Figure 38.4)

nominal data where numbers merely represent names. For example, the numbers on sports players' shirts a player with the number 1 on her back is not necessarily worse than a player with a 2 on her back

nomothetic any theory that looks at general or abstract laws (rather than looking at the individual or unique – see ideographic). The term tends to be associated with the acquisition of knowledge through experimentation (because the aim of experimental methods is to generate generalisable results)

non-scientific statements statements that cannot be empirically tested

normal distribution a probability distribution of a random variable that is known to have certain properties, namely, it is perfectly symmetrical and so has skew and kurtosis = 0. Technically, it is described by a hideously complicated equation, but it is more easily thought of graphically as a bell-shaped curve (see Figure 38.3)

normally-distributed data a set of scores for which the frequency distribution is a normal distribution

null hypothesis the reverse of the alternative hypothesis, that is, that your prediction is wrong and that the predicted effect does not exist. Incidentally, this hypothesis is never true, despite what people might have you believe

observational design a general term for research in which the researcher does intervene or exert control over events or variables. This can take the form of watching, recording and coding behaviour, or surveys and questionnaire research

one-tailed hypothesis a directional hypothesis such as 'checking Facebook in statistics classes will lead to worse marks in the statistics exam'. This is directional because you predict a direction for the effect exam marks will be worse if you check Facebook in your statistics class

one-tailed test a test of a directional hypothesis such as 'checking Facebook in statistics classes will lead to worse marks in the statistics exam'. This is directional because you predict a direction for the effect exam marks will be worse if you check Facebook in your statistics class

one-way independent ANOVA a test of whether the means of three or more conditions differ when data across those conditions are independent (e.g. different participants have been tested in different conditions)

one-way repeated measures ANOVA a test of whether the means of three or more conditions differ when data across those conditions are related (e.g. the same participants have been tested in all conditions)

opportunity sampling a sample of entities that happen to be available

ordinal data data that tell us not only that things have occurred, but also the order in which they occurred. These data tell us nothing about the differences between values. For example, gold, silver and bronze medals are ordinal they tell us that the gold medallist was better than the silver medallist, however, they don't tell us how much better (was gold a lot better than silver, or were gold and silver very closely competed?)

outcome variable a variable whose values we are trying to predict from one or more predictor variables. Also known as a dependent variable

outliers an extreme score, which is unrepresentative of the scores to which it belongs

P-value the probability of a test statistic at least as extreme as the one observed occurring, if the null hypothesis is correct

partial correlation a measure of the relationship between two variables while 'controlling' the effect that one or more additional variables has on both

Pearson's r see correlation

platykurtic a distribution of scores that has a relatively large number of scores at the extremes. These distributions tend to look flat (see Figure 38.4)

population in statistical terms this usually refers to the collection of units (be they people, plankton, plants, cities, suicidal authors, etc.) to which we want to generalise a set of findings or a statistical model

positive skew a property of a distribution of scores indicating that scores cluster at the lower end and the distribution tails off towards the higher, more positive, scores (see Figure 38.4)

post hoc tests a set of procedures for comparing differences between pairs of means usually carried out when no specific hypotheses have been made about how groups will differ. They are usually used after an analysis of variance in which a significant effect has been found relating to several group means. Multiple comparisons are used to then determine which of the group means differ by comparing all combinations of pairs of group means. Typically, each test is a t-test but corrected for the fact that many tests are done

power the probability of rejecting the null hypothesis when it is actually false

practice effects the possibility that performance on a task changes (the assumption is for the better) when a task is performed more than once

predictor variable a variable that is used to try to predict values of an outcome variable. It is used synonymously (by me at least) with independent variable

qualitative research extrapolating evidence for a theory from what people say or write (contrast with quantitative methods)

quantitative research inferring evidence for a theory through measurement of variables that produce numeric outcomes (contrast with qualitative methods)

quartile values of a set of ordered observations that split those observations into four equal sized groups

quasi-experimental design a research design in which the experimenter has no control over either the allocation of participants to conditions, or the timing of the experimental manipulations

quota sampling a quota sample is an attempt to make a sample representative by having the same proportion of different groups of people in the sample and in the population

random sampling participants for research are selected randomly from the population of interest

randomising in the context of an experiment, this means that participants have been placed in one condition or another of the study in a non-systematic way

range the difference between the highest and lowest scores in a set of data

ratio data interval data but with the additional property that ratios are meaningful (e.g. a score of 4 indicates twice as much of a property as a score of 2)

regression a statistical technique that aims to quantify the relationship between an outcome variable and one or more predictor variables

regression line see line of best fit

reliability the ability of a measure to produce consistent results when the same entities are measured under different conditions. One way to conceptualise this is that, other things being equal, a person should get the same score on a measure if they complete it at two different points in time (this is called test-retest reliability). Another way to think of it is that two people, who are the same in terms of the construct being measured, should get the same score

repeated measures design an experimental design in which each participant takes part in all of the conditions in the experiment

sample a smaller (but hopefully representative) collection of units from a population used to determine truths about that population

sampling the process of selecting entities for a sample

sampling distribution the distribution of possible values of a given statistic that we could expect to get from a given population

sampling error the deviation of a sample parameter or statistic from the 'true' value in the population

sampling variation the fact that the value of any statistic estimated from a sample will depend somewhat on the sample taken. As such the statistic will vary slightly from sample to sample

scatterplot a graph showing the relationship between two variables, X and Y. Each point on the graph represents an individual's permutation of X and Y values (see Figure 38.11 for examples)

scientific statements statements that can be verified with reference to empirical evidence

semi-partial correlation a measure of the relationship between two variables while 'controlling' the effect of one or more additional variables has on one of the original variables

skew the degree to which a frequency distribution is symmetrical. See positive skew and negetaive skew

snowball sampling a snowball sample is taken when a participant is used to introduce the researcher to further participants

Spearman's ρ Pearson's correlation coefficient (see correlation) applied to ranked data. It can be used when the assumptions of Pearson's correlation have not been met

split-half reliability a measure of the reliability of a questionnaire or test based on the correlation between performance on one randomly-selected half of the questionnaire/test and the other half

standard deviation average variability of scores around their mean that is not in the original units of measurement. It is the square root of the variance

standard error of the mean this is the standard deviation of a set of sample means

statistically significant a test statistic is said to be statistically significant if the probability of it occurring is very small (usually less than 0.05). Statistical significance does not necessarily equate to real life importance

sums of squares see sum of squared errors

sum of squared errors a measure of the total variability in the data. For each score, the deviation from the mean is calculated, and then squared. The sum of squared errors is the sum of these squared deviations

systematic sampling a systematic sample is a sample constructed by taking every *n*th individual from a list of names

systematic variation variation due to some genuine effect (e.g. the effect of an experimenter doing something to all of the participants in one sample but not in other samples)

tertium quid the possibility that an apparent relationship between two variables is actually caused by the effect of a third variable on them both (often called the third variable problem)

test-retest reliability see reliability

test statistic a statistic for which we know how frequently different values of this statistic occur. The observed value of such a statistic is typically used to test hypotheses

theory although it can be defined more formally, a theory is essentially a hypothesised general principle or set of principles that explain known findings about a topic and from which new hypotheses can be generated

time-series design research involving measuring a variable (or variables) at (usually) regular intervals over a long period of time

two-tailed hypothesis a non-directional hypothesis such as 'listening to your tutor will affect statistics exam marks'. This is non-directional because you do not predict a direction for the effect you haven't said whether exam marks would be better or worse because of listening to the tutor

two-tailed test a test of a non-directional hypothesis such as 'listening to your tutor will affect statistics exam marks'. This is non-directional because you do not predict a direction for the effect you haven't said whether exam marks would be better or worse because of listening to the tutor

two-way independent ANOVA a test of whether the means from different conditions differ when data across those conditions are independent (e.g. different participants have been tested in all conditions) and the conditions represent all combinations of levels of two independent variables

two-way mixed ANOVA a test of whether the means from different conditions that represent all combinations of levels of two independent variables differ. One of the independent variables must have been manipulated using the same participants (i.e. is a repeated measure) whereas the other must have been manipulated using different participants (is an independent measure)

two-way repeated measures ANOVA a test of whether the means from different conditions differ when data across those conditions are related (e.g. the same participants have been tested in all conditions) and the conditions represent all combinations of levels of two independent variables

Type I error Believing that there is a genuine effect in the population, when in reality no such effect exists

Type II error Believing that there is no effect in the population, when in reality there is

unsystematic variation variation in the outcome variable that is not due to the effect in which we're interested

upper quartile the value in a set of ordered observations that splits the highest 25% of scores

validity evidence that a study allows correct inferences about the question it was aimed to answer. Evidence that a test measures what it set out to measure conceptually

variable anything that can be measured and can differ across entities or across time

variability the spread of scores around their mean

variance a measure of the average variability of scores around their mean that is not in the original units of measurement. It is the sum of squared errors divided by the number of observations or values used to calculate that total

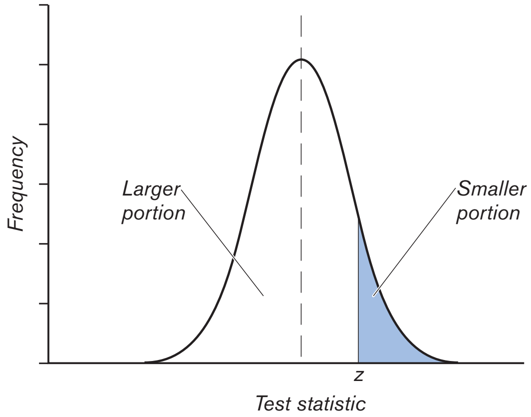
volunteer sampling a sample consisting of people who have volunteered to take part in research

Wilcoxon signed-rank test a test of whether scores from two conditions differ, when the same people were tested in both conditions. It can be used in place of the dependent *t*-test when its assumptions have not been met

within-subjects design see repeated measures design

Appendix

Probability values of *z*-scores from the normal distribution (values calculated by Andy Field using SPSS version 11)



z	Larger portion	Smaller portion
.00	.50000	.50000
.01	.50399	.49601
.02	.50798	.49202
.03	.51197	.48803
.04	.51595	.48405
.05	.51994	.48006
.06	.52392	.47608
.07	.52790	.47210
.08	.53188	.46812
.09	.53586	.46414
.10	.53983	.46017
.11	.54380	.45620
.12	.54776	.45224
.13	.55172	.44828
.14	.55567	.44433
.15	.55962	.44038
.16	.56356	.43644
.17	.56749	.43251
.18	.57142	.42858
.19	.57535	.42465
.20	.57926	.42074
.21	.58317	.41683
.22	.58706	.41294
.23	.59095	.40905
.24	.59483	.40517
.25	.59871	.40129
.26	.60257	.39743
.27	.60642	.39358
.28	.61026	.38974
.29	.61409	.38591
.30	.61791	.38209
.31	.62172	.37828
.32	.62552	.37448
.33	.62930	.37070
.34	.63307	.36693
.35	.63683	.36317
.36	.64058	.35942
.37	.64431	.35569
.38	.64803	.35197
.39	.65173	.34827
.40	.65542	.34458
.41	.65910	.34090
.42	.66276	.33724
.43	.66640	.33360

z	Larger portion	Smaller portion
.44	.67003	.32997
.45	.67364	.32636
.46	.67724	.32276
.47	.68082	.31918
.48	.68439	.31561
.49	.68793	.31207
.50	.69146	.30854
.51	.69497	.30503
.52	.69847	.30153
.53	.70194	.29806
.54	.70540	.29460
.55	.70884	.29116
.56	.71226	.28774
.57	.71566	.28434
.58	.71904	.28096
.59	.72240	.27760
.60	.72575	.27425
.61	.72907	.27093
.62	.73237	.26763
.63	.73565	.26435
.64	.73891	.26109
.65	.74215	.25785
.66	.74537	.25463
.67	.74857	.25143
.68	.75175	.24825
.69	.75490	.24510
.70	.75804	.24196
.71	.76115	.23885
.72	.76424	.23576
.73	.76730	.23270
.74	.77035	.22965
.75	.77337	.22663
.76	.77637	.22363
.77	.77935	.22065
.78	.78230	.21770
.79	.78524	.21476
.80	.78814	.21186
.81	.79103	.20897
.82	.79389	.20611
.83	.79673	.20327
.84	.79955	.20045
.85	.80234	.19766
.86	.80511	.19489
.87	.80785	.19215
.88	.81057	.18943
.89	.81327	.18673
.90	.81594	.18406
.91	.81859	.18141
.92	.82121	.17879
.93	.82381	.17619
.94	.82639	.17361
.95	.82894	.17106
.96	.83147	.16853
.97	.83398	.16602
.98	.83646	.16354
.99	.83891	.16109
1.00	.84134	.15866
1.01	.84375	.15625
1.02	.84614	.15386
1.03	.84849	.15151
1.04	.85083	.14917
1.05	.85314	.14686
1.06	.85543	.14457
1.07	.85769	.14231
1.08	.85993	.14007
1.09	.86214	.13786
1.10	.86433	.13567
1.11	.86650	.13350
1.12	.86864	.13136
1.13	.87076	.12924
1.14	.87286	.12714
1.15	.87493	.12507
1.16	.87698	.12302
1.17	.87900	.12100
1.18	.88100	.11900
1.19	.88298	.11702
1.20	.88493	.11507
1.21	.88686	.11314
1.22	.88877	.11123
1.23	.89065	.10935
1.24	.89251	.10749
1.25	.89435	.10565
1.26	.89617	.10383
1.27	.89796	.10204
1.28	.89973	.10027
1.29	.90147	.09853
1.30	.90320	.09680
1.31	.90490	.09510
1.32	.90658	.09342
1.33	.90824	.09176
1.34	.90988	.09012
1.35	.91149	.08851
1.36	.91309	.08691
1.37	.91466	.08534

z	Larger portion	Smaller portion
1.38	.91621	.08379
1.39	.91774	.08226
1.40	.91924	.08076
1.41	.92073	.07927
1.42	.92220	.07780
1.43	.92364	.07636
1.44	.92507	.07493
1.45	.92647	.07353
1.46	.92785	.07215
1.47	.92922	.07078
1.48	.93056	.06944
1.49	.93189	.06811
1.50	.93319	.06681
1.51	.93448	.06552
1.52	.93574	.06426
1.53	.93699	.06301
1.54	.93822	.06178
1.55	.93943	.06057
1.56	.94062	.05938
1.57	.94179	.05821
1.58	.94295	.05705
1.59	.94408	.05592
1.60	.94520	.05480
1.61	.94630	.05370
1.62	.94738	.05262
1.63	.94845	.05155
1.64	**.94950**	**.05050**
1.65	.95053	.04947
1.66	.95154	.04846
1.67	.95254	.04746
1.68	.95352	.04648
1.69	.95449	.04551
1.70	.95543	.04457
1.71	.95637	.04363
1.72	.95728	.04272
1.73	.95818	.04182
1.74	.95907	.04093
1.75	.95994	.04006
1.76	.96080	.03920
1.77	.96164	.03836
1.78	.96246	.03754
1.79	.96327	.03673
1.80	.96407	.03593
1.81	.96485	.03515
1.82	.96562	.03438
1.83	.96638	.03362
1.84	.96712	.03288
1.85	.96784	.03216
1.86	.96856	.03144
1.87	.96926	.03074
1.88	.96995	.03005
1.89	.97062	.02938
1.90	.97128	.02872
1.91	.97193	.02807
1.92	.97257	.02743
1.93	.97320	.02680
1.94	.97381	.02619
1.95	.97441	.02559
1.96	**.97500**	**.02500**
1.97	.97558	.02442
1.98	.97615	.02385
1.99	.97670	.02330
2.00	.97725	.02275
2.01	.97778	.02222
2.02	.97831	.02169
2.03	.97882	.02118
2.04	.97932	.02068
2.05	.97982	.02018
2.06	.98030	.01970
2.07	.98077	.01923
2.08	.98124	.01876
2.09	.98169	.01831
2.10	.98214	.01786
2.11	.98257	.01743
2.12	.98300	.01700
2.13	.98341	.01659
2.14	.98382	.01618
2.15	.98422	.01578
2.16	.98461	.01539
2.17	.98500	.01500
2.18	.98537	.01463
2.19	.98574	.01426
2.20	.98610	.01390
2.21	.98645	.01355
2.22	.98679	.01321
2.23	.98713	.01287
2.24	.98745	.01255
2.25	.98778	.01222
2.26	.98809	.01191
2.27	.98840	.01160
2.28	.98870	.01130
2.29	.98899	.01101
2.30	.98928	.01072
2.31	.98956	.01044

z	Larger portion	Smaller portion
2.32	.98983	.01017
2.33	.99010	.00990
2.34	.99036	.00964
2.35	.99061	.00939
2.36	.99086	.00914
2.37	.99111	.00889
2.38	.99134	.00866
2.39	.99158	.00842
2.40	.99180	.00820
2.41	.99202	.00798
2.42	.99224	.00776
2.43	.99245	.00755
2.44	.99266	.00734
2.45	.99286	.00714
2.46	.99305	.00695
2.47	.99324	.00676
2.48	.99343	.00657
2.49	.99361	.00639
2.50	.99379	.00621
2.51	.99396	.00604
2.52	.99413	.00587
2.53	.99430	.00570
2.54	.99446	.00554
2.55	.99461	.00539
2.56	.99477	.00523
2.57	.99492	.00508
2.58	.99506	.00494
2.59	.99520	.00480
2.60	.99534	.00466
2.61	.99547	.00453
2.62	.99560	.00440
2.63	.99573	.00427
2.64	.99585	.00415
2.65	.99598	.00402
2.66	.99609	.00391
2.67	.99621	.00379
2.68	.99632	.00368
2.69	.99643	.00357

z	Larger portion	Smaller portion
2.70	.99653	.00347
2.71	.99664	.00336
2.72	.99674	.00326
2.73	.99683	.00317
2.74	.99693	.00307
2.75	.99702	.00298
2.76	.99711	.00289
2.77	.99720	.00280
2.78	.99728	.00272
2.79	.99736	.00264
2.80	.99744	.00256
2.81	.99752	.00248
2.82	.99760	.00240
2.83	.99767	.00233
2.84	.99774	.00226
2.85	.99781	.00219
2.86	.99788	.00212
2.87	.99795	.00205
2.88	.99801	.00199
2.89	.99807	.00193
2.90	.99813	.00187
2.91	.99819	.00181
2.92	.99825	.00175
2.93	.99831	.00169
2.94	.99836	.00164
2.95	.99841	.00159
2.96	.99846	.00154
2.97	.99851	.00149
2.98	.99856	.00144
2.99	.99861	.00139
3.00	.99865	.00135
…	…	…
3.25	.99942	.00058
…	…	…
3.50	.99977	.00023
…	…	…
4.00	.99997	.00003

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Index

3-D effects 155, 163–4, 582
5-HT *see* serotonin

a-fetoprotein 98
α-level 589
'A not B' errors 252–3
AAI (adult attachment interviews) 288–9
Aaronson, D. 208
Abelson, R.P. 201
abnormal behaviour 470–2
  attribution processes 499
  cultural norms 470–1
  social norms 470–1
  statistical norms 470
abnormal conditions focus (ACF) model 337
Abraham, Charles 606
Abramson, L.Y. 493–4
abscissa axis 569
absolute refractory period 82
abstract thought 256
abstraction level of development 263, 264
abstracts of reports 625
abuse of drugs 116
academic psychology 413–15
acceptance 380–1
accessibility of memories 193
accessing study resources 631
accommodation 251
accuracy of statistics 586–8
acetylcholine (ACh) 85, 87–8, 132, 148
ACF (abnormal conditions focus) model 337
ACh (acetylcholine) 85, 87–8, 132, 148
achievement motivation 399
Ackerman, P.L. 456
acquiescence 459–60
acquired dyslexias 213, 214
acquisition 103, 109
ACTH (adrenocorticotrophic hormone) 131
action potential 82, 117, 145
activation models 166, 215
activational hormone effects 97
active learning 614, 616–17, 620–2
actor-observer differences 341–2
actualisation 12
Aδ-fibres 146
Adams, J. 354
adaptation 251
adaptational psychology 6
addiction
  animal models 59
  aversion therapy 515
  DRD4 gene 67
  genetics 68
  substance misuse 116
  theories 119–20
Aδ-fibres 146
ADHD (attention deficit hyperactivity disorder) 63, 67, 386
adipsia 121
Adler, Alfred 10, 416, 418
adolescence 256, 257, 297–8, 527
'adolescent invulnerability' 527
adoption studies 430, 442, 446–7
Adorno, T.W. 374
adrenaline 84, 86, 127, 131
adrenocorticotrophic hormone (ACTH) 131
adult attachment interviews (AAI) 288–9
adult-child interactions
  attachment 287–90, 291, 300
  cognitive development 256, 257, 265
adult development 246, 288–9
advice role of researchers 556
afferent nerves 71, 102
age factors
  doctor consultations 531
  personality 427
aggression
  biosocial approach 359
  brain mechanisms 130
  experiments 22–3
  hormones 130
  internal validity 25
  learning approach 359
  measurement 28
  social interaction 357–9
agnosia 157, 159
agonists 91
agoraphobia 480–1
Aiken, L.R. 459
Aitchison, Jean 206
Ajzen, I. 322–3, 530
Albery, Ian P. 302, 312
alcohol
  aversion therapy 104, 105, 515
  foetus effects 240
aldosterone 123
algorithms 221, 222, 230
alleles 62
Allison, P.J. 432
allocation of attention model 175–6
Allport, D.A. 176
Allport, Gordon W. 315–16, 318, 376, 414–16, 426
alpha activity 131
α-level 589
alpha tests 35
alphabetic stage of reading 279
αMPT 92
alternative hypotheses 542–3, 588–9
Altman, J. 116
altruism 27, 355
Alwin, N. 501
Alzheimer's disease
  anticholinesterase inhibitors 94
  cerebral ventricles 72
  developmental psychology 76
  genetics 68
  multiple sites of action 94
AM (autobiographical memory) 196–8
amacrine cells 138, 139
ambivalent infants 289–90
American Psychiatric Association (APA) 473
American Psychological Association (APA) 579
American research bias 32
American sign language (ASL) 206
Ames, C. 396
Ames' room 153–4
amine hormones 95
amino acids 66
amnesia 183, 184, 187–8, 196
AMPA receptors 112–13
amphetamines 90, 92, 100, 117–18, 498
αMPT 92
amputations of limbs 535–6
amygdala 79
  aggression 130
  connections 129
  emotional brain 127–8
  emotional experiences 386
  olfaction 144
  stress 131
AN (Anorexia Nervosa) 122, 503–5, 521
anal stage of development 11, 419
analogies 220–1
analogue studies 487
analysis of data 542, 550, 564–5, 591, 599–600
analysis of variance (ANOVA) 337, 338, 565, 595–8
analytic intelligence 445
analytical thinking 618, 630
Ancient Greece 5
Anderson, C.A. 385
Anderson, John R. 153, 171, 177, 222–3, 225, 228
Anderson, R.C. 202
Andre, C. 404
Andreasen, N.C. 510
Andrews, G. 523
androcentrism 33–5
androgens 98, 130
anger 380–1
angiotensin 123, 393
Angrist, B. 498
animal phobias 480
animal research 57–9
  imprinting 287
  language 204–7
  learning/cognition 100–14
  validity 58–9
Anorexia Nervosa (AN) 122, 503–5, 521
ANOVA (analysis of variance) 337, 338, 565, 595–8
ANS (autonomic nervous system) 71, 382
Antabuse 105
antagonists 91

anterior lateral system 145, 146
anterograde amnesia 183
anticholinesterase inhibitors 94
anticipation 380–1
antidepressants 91, 94, 492, 508–10
antipsychotic drugs 508–9
antisocial behaviour 15
antisocial personality disorder (ASPD) 501–2
antivivisection movement 57
anxiety/anxiety disorders 478–90
  benzodiazepines 132
  cognitive therapy 519, 520
  definition 478
  drug treatment 510
  GAD 482–5
  hierarchies 514
  inverse agonists 91
  pain anxiety 537
  panic disorder 480–2
  psychopathology models 467–9
  PTSD 488–90
  specific phobias 478–80
  treatment efficacy 523
anxiolytic drugs 508–9, 510
APA (American Psychiatric Association) 473
APA (American Psychological Association) 579
ape communication 206–7
aphagia 121
aphasia 78
apomorphine 94
apoptosis 75
apparatus section of reports 627
appearance 405
apperceptive agnosia 2, 159
appetite 394
applied psychologist title 610
appraisal of stress 533, 536
apprehension model 367
approaches to studying inventory (ASI) 620
apraxia 78
arbitrariness 204
archival research 310
arcuate nucleus 121
Ardelt, M. 427
Argyle, M. 351
Army alpha/beta tests 35
aromatherapy 144
aromatisation hypothesis 98
arousal theory
  emotions 381–2, 384–5, 387
  motivation 392–3
  personality 428–9
  PTSD 488
artefacts 26–8, 128
artificial intelligence 13
Asch, Solomon E. 346–8, 364–5
ASI (approaches to studying inventory) 620
ASL (American sign language) 206
Aslin, R.N. 273
Asmundson, G.J.G. 537
ASPD (antisocial personality disorder) 501–2
Aspinwall, L.G. 533
assessment
  definition 454
  disorder classification 473
  study skills 615, 619, 625–7, 629–31
assimilation 251
associative agnosia 159
associative learning 100, 112, 223, 318–19
associative networks 199, 304, 305
assumptions of parametric tests 591, 594, 597
ataque de nervos panic disorder 471
ataxia 148
Atkinson, John 399
Atkinson, R.C. 189–90
attachment 287–90, 291, 300
attention 169–82
attention deficit hyperactivity disorder (ADHD) 63, 67, 386
attentional demands 176–7
attentional filters 171–2
attenuation model 172
attitudes 315–30
  associative learning 318–19
  behaviour relationships 321, 323
  changing 315, 323–9
  classical conditioning 318
  conative component 318
  definitions 316
  development 318–19
  direct measurement 320
  functions 316–17
  importance 315
  indirect measurement 320–1
  intention 318
  knowledge function 317
  mainstream views 17
  measurement 319–23
  self-esteem 316–17
  self-perception 319
  semantic differential scales 319, 320
  social constructionism 17
  social identity function 317
  structure 317–18
  utilitarian function 317
attraction-similarity hypothesis 353
attractiveness 60
attribute model of concepts 200
attribution 333–44
  biases 340–2
  blame 339
  definitions 334
  deliberate attributions 340
  emotions 387
  errors 340–2
  motivation models 338–9, 395–6, 397
  personality models 412–13
  responsibility 339
  schizophrenia 499
  spontaneous attributions 340
  theories 333, 493–4
  three-stage model 340
atypical drugs 90
audition 142–4
auditory cortex 144
auditory nerve 144
auditory stimuli
  focused attention 170–1
  single vs multiple 178–9
  word recognition 164–5
augmentation principles 338
Augoustinos, M. 307
authority 369–72
autism
  central coherence 296
  development 300
  executive functioning 296
  theory of mind 295, 296
  triad of impairments 295
autobiographical episodes 196
autobiographical knowledge 196
autobiographical memory (AM) 196–8
autocratic leaders 373
autokinetic effect experiment 364, 365
automatic processes/processing 169, 180, 192
automaticity
  attention 176–7, 179
  reading 229
autonomic nervous system (ANS) 71, 382
autonomous adults 290
autonomous morality 259
autonomous-stage skill acquisition 229
autoreceptors 89–90, 94
autosomes 63
availability heuristic 226, 304
availability of memories 193
averages
  hypothetical 38
  law of 226
  see also mean
Averbach, E. 173
aversion therapy 10, 105, 515
aversive conditioning 104
avoidant infants 289–90
Ax, A.F. 383
axes of DSM-IV-TR classification 473
axon hillock 73, 82
axons 73–4, 82, 83
Ayd, F.J. 491
Ayllon, T. 466, 515, 517
Azrin, N.H. 515, 517

ß-level 590
Babigian, H.M. 499
baby talk 275, 276, 278
backpropagation 277
backstage preparation, self-presentation 405
Baddeley, A.D. 179, 183–4, 187, 189–90, 193–4, 280, 615
Baer, D.M. 517
Bahrick, H.P. 186
Baillargeon, R. 254
Baker, C.A. 499
Baker, R. 517
balance beam studies 263
balance scale studies 255, 260–2
balance theory 324, 325
Baldwin, M.W. 319
Ball, K. 505
Banaji, M.R. 318, 321
Bandura, Albert 10, 237–8, 359, 395, 417, 422, 495
Banyard, P. 35
Banzett, L.K. 517
bar charts 579–80, 582
barbiturates 132
Bard, Philip 126, 387
Bargh, John 306, 349–50
Barker, C. 523
Barker, R. 50
Barlow, D.H. 483
Barnum effect 407
Baron, R.A. 302, 368
Baron-Cohen, S. 293, 295

baroreceptors 122, 123
Barrick, M.R. 457
barriers to problem solving 219–20
Bartels, A. 130
Bartlett, F.C. 8, 194, 200–1
BAS (behavioural activation system) 428
basal ganglia 80, 85, 88, 148
base rate information 225–6
basilar membrane 143–4
basolateral nuclei 127
Bass, E. 415
Bateson, Gregory 498
Bateson, P. 563
Batson, C.D. 355
Baumeister, R.F. 409, 421
BBB (blood–brain barrier) 72
BD (body dissatisfaction) 505
Beck, Aaron 492–4, 519
Becker, M.H. 529
Beckham, David 179
Beecher, H.K. 535
behaviour
    abnormal behaviour 470–2
    animal models 58–9
    anticipating 610
    coding 563
    heredity/environment debate 48–50
    intergroup behaviour 374–6
    leaders 373
    levels of explanation 45
    motivation/reward 115–24
    personality paradigms 417
    psychobiological accounts 59
    social interaction 350–5
    see also health psychology
behaviour analysis/modification 513
behaviour therapies 510, 512–22
behavioural activation system (BAS) 428
behavioural bioassay 58
behavioural genetics 15, 59–63, 244–5, 429–31, 446–7
behavioural inhibition system (BIS) 428
behavioural neuroscience *see* psychobiology
behavioural pathogens 526–7
behavioural self-control 517–19
behaviourism 9–10
    biological reductionism 44
    child development 237
    determinism 47
    evaluation 10
    handshakes 9
    historical issues 7
    key features 9–10
    operant conditioning 105–6
    psychopathology 469–70
    schedules of reinforcement 108
belief-desire theory 294
beliefs
    Beck's negative triad 493
    health belief model 528–30
    specific phobias 478–9
    worry 485
Bell, M.A. 253
Bellak, L. 456
Bem, Daryl 319, 325–6, 406
Bendall, S. 523
benefits of health behaviours 529–30
Bennett, C. 619
Bentall, R.P. 499
Benton, D. 448
benzodiazepines (BZs) 91, 132, 510
Berendes, H. 448
bergamot 144
Berger, P.J. 307
Bernoulli, Jacob 565
Berridge, K.C. 120
beta activity 131–2
ß-level 590
beta tests 35
between-group design 38, 559
Betz, E.L. 421
Bezdek, K. 194
bias 32–42
    animal language studies 206
    attribution 340–2
    decision making 226–7
    emotions 382
    experimental research 546–7
    health psychology 527
    hypothesis testing 224–5
    information processing 484, 499
    mean 572
    non-experimental research studies 246
    optimistic 2
    psychometric testing 460–1
    reductionism 46
    self-perception 407–8
bibliographic databases 631
Biederman, I. 163–4
Big Brother show 607
Big Five personality traits 427
Billig, M. 550
bimodal distributions 571
binding 89, 273–5
Binet, Alfred 8, 237, 438, 439, 453
binge eating 503, 505
binocular convergence 155–6
binocular cues 155
binocular vision 139
biochemistry 15
biogeography 60
biological factors
    adolescence 297
    behaviourism 10
    difference research 34, 286–7
    early development 239–41
    emotions 382–6
    feature detectors 162
    gender differences 286–7
    intelligence 446–7
    motivation 392–3
    personality 417, 427–32
    popular explanations 50
    see also genetics; physiological approach
biological preparedness 479
biological psychology *see* psychobiology
biological reductionism 44
biological treatments 508–10
biomedical model of medicine 526
biopsychology *see* psychobiology
biopsychosocial approach 504–5, 529
biosocial approach 359
biotechnology 66–8, 116
bioterrorism 92
bipolar cells 137
bipolar disorder 491
Birch, A. 44
birth effects 239
BIS (behavioural inhibition system) 428
Bisiach, E. 175
BITCH (black intelligence test of cultural homogeneity) 461
bitter tastes 146
bizarre behaviours 466–7
Black, D.W. 510
black intelligence test of cultural homogeneity (BITCH) 461
Blackwell, B. 532
Blaine, David 122
blame attribution 339
Blass, T. 423
Bleuler, Eugen 496
blind spot 137
Bloch, S. 520
blood–brain barrier (BBB) 72
blood glucose factors 431
Bloom, B.S. 615
BN (Bulimia Nervosa) 122, 503–5
Bodamer, J. 161
bodily fluid theory 428
bodily–kinesthetic intelligence 443
body attractiveness 60
body dissatisfaction (BD) 505
Bohner, G. 318, 329
Boldero, J. 407
Bolton, D. 488
Bond, Frank 608
Bond, M.H. 372
Boneva, B.S. 409
boredom effects 559
Borgida, E. 337
Boring, Edwin G. 8
Borkenau, R. 430
Borkovec, T.D. 483, 485, 523
Borton, R.W. 253
Borucki, Z. 399
bottlenecks 172
bottom-up processes 165–6
Bouchard, T.J. 430
Boudewyns, P.A. 517
Bourne, V.J. 447
Bousfield, W.A. 191
Bower, G.H. 191, 224
Bower, T.G.R. 252
Bowlby, John 288, 291, 420
boxplots (box whisker diagrams) 580–1, 583
Bozarth, M.A. 120
Bozna, M. 399
BPS *see* British Psychological Society
Bradley, B.P. 484
Bradley, C. 524
Bradley, L. 279, 280
Bradman, Donald 179
Bradshaw, P.W. 192
brain 71–99
    communication 81–91
    development 37, 50, 75–6
    drinking behaviour 123
    eating behaviour 120–2
    functioning 15, 486
    gustatory system 146
    motor control 147–8
    OCD 486
    personality research 431
    physiological approach 15
    psychological characteristics 50
    reductionism 54

  regions 76–81
  reward mechanisms 115–24
  sexual differentiation 98
  size/structure 446
brain-damaged patients 174–6, 183, 188, 296
Brainerd, C.J. 259–60
breaks in study 615
breastfeeding research 245–6
Breggin, P. 510
Brehm, J.W. 493
Breslau, N. 488
Brewer, M.B. 376
Brewin, C.R. 488, 490, 524
brightness constancy 153–4
British National Formulary 91
British Psychological Society (BPS)
  code of conduct 553–4
  ethics 29, 57
  founding 8
  health psychology 526, 606
  Lesbian and Gay Psychology division 39
  professional training 610
  psychobiology 56–7
Broadbent, D. 171–2, 194
Broca, Pierre Paul 7
Broca's area 78
Brocke, B. 428
Bronfenbrenner, U. 446
Brooks, L. 200
Brooks-Gunn, J. 285
Brown, G.W. 499
Brown, J.D. 407
Brown, R. 196, 210–11, 276, 342, 365, 374, 533
Brown, R.W. 318
Brown, T.A. 486
Brown–Peterson technique 186
Browne, K.D. 399
Brubaker, R. 530
Bruce, V. 161
Bruner, J.S. 165, 223–5, 262, 347
Bruno, Frank 468
Bruyer, R. 161
Bryant, P.E. 279, 280
Buckley, N. 517
Bucy, P.C. 127
Bulimia Nervosa (BN) 122, 503–5
Bullock, W.A. 428
bullying behaviour 290–2
Bunge, M. 431
Bunney, W.E. 492
buproprion 119
Burger, J.M. 339
Burkett, B.G. 489
Burt, Cyril 27, 28
Burt, D.R. 498
Buss, D. 392, 415, 429
Butler, A.C. 519, 524
Butler, G. 482
Butterworth, G. 252–3, 404
button phobia 479
Butzlaff, R.L. 500
Byrne, D. 302, 368
bystander calculus model 356–7
bystander effect 356
bystander intervention 356–7
BZs (benzodiazepines) 91, 132, 510

C-fibres 146
Ca^{++} (calcium) 81, 84
Cacioppo, J.T. 316, 317, 326–7
calcium 81, 84
Calne, D.B. 90
Campbell, D. 557
Campbell, Liz 603
Campbell, N.A. 61
cannabis 91
Cannon, Walter 126, 384–5
Cannon–Bard theory 126, 387
CAP model of assessment 630
capacity
  long-term memory 185
  model of attention 175
  short-term memory 185, 186
capsicum 146
Cardaci, M. 395
cardinal traits 426
Cardno, A.G. 497
careers 603–11
caregivers
  infant attachment 287–90, 291, 300
  speech development 270–1, 274, 275–7
  theory of mind development 293
caring therapies 523
Carlsmith, J.M. 324–5, 562, 599
Carlsson, A. 498
Carpenter, P.A. 209
Carr, S.C. 302
Carroll, J.B. 441, 445
Carson, R.C. 473
Cartesian dualism 5
Carver, C.S. 527
case study methodology 563–4
Cashdan, E. 429
Casper, R.C. 504
castration anxiety 11
casual attribution 333
CAT (children's apperception test) 456–7
cataplexy 133
catastrophising worry 483–4
catatonic schizophrenia 496–7
categorical data 599
categorical self 284
categorisation
  associative networks 305
  hierarchical representation 305
  social psychology 304–5
Catshall, - 198
Cattell, Raymond 415, 416, 425, 441
causal inferences 565
causal schemata 337
cause–effect relationships 23, 38–9, 546–8, 561
cause-to-event attribution 334
CBT (cognitive behaviour therapy) 120, 470, 510, 519–20
CD (conduct disorder) 502
CDS (child-directed speech) 275, 276, 278
Ceci, S.J. 446
cells, nervous system 73–5
cellular differentiation 75, 76
central coherence 296
central executive 179, 190
central nervous system (CNS) 71–2, 136
central resource theory 178, 180
central tendency measures 570–5, 578
central traits 346, 426
centration 255, 260
CER (conditioned emotional response) 103–4, 128
cerebellum 80–1, 148
cerebral commisures 77
cerebral ventricles 72
cerebrospinal fluid (CSF) 72, 122
cerveau isole 132
CFS (chronic fatigue syndrome) 531, 533
Chaiken, S. 316–17, 319, 321, 325, 329
challenging behaviour 515–16
Chambless, D.L. 482, 519, 524
Chamorro-Premuzic, Tomas 607
Chandler, Chris 53–149
change/development distinction 236
Chapman, T.F. 495
characteristics of personality 412
Chartered Psychologist status 469, 603–4
'chartjunk' 583–4
Chase, W. 192, 230, 616
Chemers, M.M. 372
chemical effects on development 239–41
Cherry, E.C. 170–1
Chi, M.T. 229
chi-square test 597, 598–9
Child, I.L. 412
child-directed speech (CDS) 275, 276, 278
children
  amnesia 196
  autism 295–6
  cognitive development 250–67
  consent 554
  developmental psychology 234–300
  educational psychology careers 605
  intelligence 447–8, 459
  language 204, 207
  memory 260
  mental tests 440
  moral judgement development 257–9
  personality research 430
  psychoanalytic model 469
  research methods 256
  self development 284–300, 404
  sexual abuse 311
  sleep 133
  social development 284–300
  stages of development 511
  study data collection 246–7
  terminology 235
  withdrawal from research 554–5
children's apperception test (CAT) 456–7
chilli 146
chimpanzee studies 37, 206–7
Chinese characters 223
chloride 81
chlorpromazine 90
Choi, I. and Y. 409
choice 47
Chomsky, Noam 48, 204, 207, 237, 272–3
Christenson, A. 523
chromosomes 63–4, 97, 241, 243
chronic fatigue syndrome (CFS) 531, 533
chronic features of distress/impairment 472
Church, A.T. 423
church dominance 6
Chwalisz, K. 385
Cialdini, Robert B. 355
cigarettes *see* smoking
cingulate cortex 79, 127
Cl^- (chloride) 81

- Clancy, S.A. 489
- Clark, David M. 481–2, 490
- classical conditioning 10, 102–4
  - attitudes 318
  - phobias 479–80
  - therapies based on 513–15
- classifying disorders 472–4
- classroom motivation 398
- clean-up proposal 160, 162
- clearing house schemes 605
- Clever Hans 26
- client-centred therapy 512
- Clifford, B.R. 198
- clinical psychology 469
  - careers 604–5
  - personality research 413–14
  - psychopathology 465
  - research 413–14, 487
- *A Clockwork Orange* 104, 515
- Cloniger, C. Robert 417
- closure principle 152, 153
- clothes 405
- clozapine 94
- cluster sampling 566
- CNS (central nervous system) 71–2, 136
- co-occurrence hypothesis 329
- cocaine 94, 117–18, 240
- cochlea 143–4
- ‘cocktail party’ phenomenon 170–1
- codes of conduct 553–4, 556
- coding behaviour 563
- Codol, J.P. 369
- codons 66
- coefficient of determination 592
- Coen, K.M. 118
- cognition *see* cognitive development; cognitive psychology
- cognitive appraisal 387–8
- cognitive attribution 387
- cognitive behaviour therapy (CBT) 120, 470, 510, 519–20
- cognitive-behavioural paradigm 417, 420, 421–2
- cognitive-contextual theories 443–5
- cognitive development 250–67
  - guide map to theory 629
  - information processing/representations 259–64
  - moral judgements 257–9
  - Piaget’s theories 251–7, 629
  - sociocultural influences 264–6
  - theory of mind 292–5
- cognitive dissonance theory 324–5, 562, 599
- cognitive learning 112
- cognitive load 304
- cognitive maps 110–11
- cognitive misers 303
- cognitive neuropsychology 13
- cognitive psychology 13–14, 150–233
  - animal cognition 100–14
  - attention 169–82
  - determinism 48
  - emotions 126–7, 381–8
  - evaluation 14
  - free will 48
  - GAD 484
  - handshakes 9
  - intelligence 442–5
  - key features 13
  - language 204–17
  - machine reductionism 44
  - memory 183–203
  - motivation 393–6
  - pain models 537
  - perception 151–68
  - psychopathology 470
  - reasoning 218–33
  - thinking 218–33
  - triadic relationships 293
  - *see also* cognitive development
- cognitive stage model 358
- cognitive-stage skill acquisition 177, 228
- cognitive testing 454, 455–6
- cognitive therapy 120, 470, 483, 510, 519–20
- cognitive x value theory 394
- cognitivism *see* cognitive psychology
- Cohen, J. 589–90
- Cohen, R.L. 616
- Cohen, S. 532
- Cohen’s *d* 590
- cohort studies 212, 246, 442
- Colby, A. 257, 259
- Coleman, J.C. 297, 298
- collaborations 265, 613–14, 619
  - *see also* groups
- collecting data *see* data collection
- collectivist identity 409
- college careers 609
- Collins, A.M. 199
- Collins, S.C. 619
- colour constancy 153, 154
- colour representativeness 200
- Coltheart, M. 185, 278
- commercial careers 603
- common sense 1, 2
- common traits 426
- communication
  - animals 204–7
  - autism 295–6
  - brain 81–91
  - child development 268–83
  - definition 271–2
  - doctor–patient 531–2
  - early social development 285
  - emotions 381
  - family therapy 520
  - health psychology 520, 530–2
  - language acquisition 268–78, 281
  - literacy 278–81
  - study skills 618, 623
  - *see also* language
- community treatment 509
- comorbidity 474
- comparative psychology 7, 44, 524
- comparative treatment groups 523–4
- compatible trials 563
- competency variables 422
- competing task allocation 175–6
- competitive drugs 91, 92
- complex behaviour 10, 109
- complex cells 140–1, 142, 162
- complex study material 615
- complexes 418
- compliance 363, 365, 529–32
- components, recognition by 163–4
- comprehension of language 207–9
- Compton, R.J. 431
- compulsions 485–6, 488
- computer games 266
- computer modelling 13, 44, 277–8, 280
- Comte, Auguste 21
- conative component of attitude 318
- concentration gradient 81
- concept learning 223–5
- conceptual issues 4–52
  - approaches to psychology 5–19
  - bias 32–42
  - intelligence 437
  - memory 198–200
  - percepts 165
  - psychology as science 20–31
- conceptualisation processes 209–10
- concluding paragraph of essays 624
- concordance studies 497–8
- concrete operations stage of development 255–6
- concurrent validity 458
- conditioned emotional response (CER) 103–4, 128
- conditioned place preference (CPP) 116–18, 119
- conditioned response (CR) 102–4
- conditioned stimulus (CS) 102–4, 479
- conditioning 10, 105–10, 513–19
  - *see also* classical conditioning
- conduct disorder (CD) 502
- cones 136–7, 138, 139
- confidence intervals 578, 579–80, 587–8
- confidentiality 556
- configuration model 336–8
- confirmation bias 224–5
- conflict theory 374–6
- conformity 363, 364, 423
- confounding variables 246, 547
- confusability 187
- connectionist system modelling 277–8, 280
- Conrad, R. 187
- conscious processes 10, 169, 415–20
- consensus 337
- consent forms 553–4, 555–6
- consequences 395
- conservation tasks 255–6
- consistency theories 324, 337
- conspecifics 61
- constancies 152–4
- constituencies 38
- constituents of sentences 207–8
- construct validity 59, 458
- constructionism *see* social constructionism
- constructive alternativism 422
- constructive memory 194
- constructive perception 165–6
- constructivist views
  - cognitive development 257
  - language acquisition 277
  - personality theories 421–2
- consumer-based treatments 524
- contact hypothesis 376
- content validity 545
- content words 211
- context
  - constancies 154
  - letter identification 162
  - object recognition 164–5
  - top-down processes 166
  - written language 213–15

context-dependent memory 194
context-specific intelligence 443–5
continuity principle 152, 153, 236
continuous reinforcement (CRF) 108
continuous variables 545
control conditions 308, 556, 558
control groups
  ANOVAs 595
  experimental design 556–61, 563
  function of 556–8
  randomised controlled trials 523–4
  t-tests 593, 594
controllability
  health 527–8
  motivation 395–6
controlled experiments 10, 13, 22–3, 28
controlled processes 169
conventional morality 34
convergence 138
  binocular 155–6
  linear perspective 157
conversation analysis 15
conversion 365–6
co-occurrence hypothesis 329
Cook, R. 448
Cooley, C.H. 406
Cooper, J. 365
coping mechanisms 382, 526, 533
Corbitt, E.M. 501
Coriell, A.S. 173
Corkin, S. 187–8
corpus callosum 77
correlation coefficients 590, 591–2
correlational research 309, 546–8, 561, 589
  compliance model 532
  developmental influences 243, 245, 246
  relationships of variables 591–2
  see also cross-sectional research
correspondence bias 341
correspondence hypothesis 321
correspondence inference theory 335–6
Corrigall, W.A. 118
Corrigan, P.W. 517
Corte, C.M. 404
cortex 76–7, 162, 384
corticotrophin-releasing hormone (CRH) 131
cortisol 131
cost-benefit health behaviour studies 529–30
cost-reward ratio 353
Costa, P.T. 415, 416, 425–7
Costello, E. 523
cotton wool phobia 479
Cottrell, N.B. 367
counselling 469
  careers 604, 605
  humanism 12
  skills 510
counterbalancing 559, 560, 596
counterconditioning 105, 513, 515
counterfactual reasoning 294
course evaluation forms 631
coursework assessment 630–1
Court, J.H. 461
Cousins, M. 409
covariation model 336–8
covariation principle 336
covert attention 173–5
CPP (conditioned place preference) 116–18, 119
CR (conditioned response) 102–4
Craik, F.I.M. 190–1, 195
cranial nerves 71, 146
creative intelligence 445
creativity 205, 630
Creole languages 273, 274
CRF (continuous reinforcement) 108
CRH (corticotrophin-releasing hormone) 131
criminal behaviours 432
Crisp, A.H. 468
criterion-referenced tests 454, 455
criterion validity 545
critical thinking skills 617, 622–3
Crombez, G. 537
Cronbach, L.J. 448, 456
Cronbach's alpha 545
Crook, C.K. 265
cross-cultural psychology 40, 442
cross-dressing 398
cross-generational continuity 290
cross-model integration 253
cross-sectional research 546–8
  child development 246
  designs 561, 563
  multiple regression 593
  see also correlational research
crossover 64
Crouch, E. 520
Crowther, J.H. 533
cryptomnesia 628
crystallised intelligence 441, 447
CS (conditioned stimulus) 102–4, 479
cues
  depth perception 155–7, 166
  health psychology 530
  optical flow pattern 158
  retrieval 193–4, 195, 198
  shifting covert attention 173–4
  unilateral visual neglect 175
Cullen, Kairen 605
cultural bias 460–1
cultural norms 470–1
cultural psychology 265–6
culture
  adolescence 297
  behavioural specificity 471
  cognitive development 264–6
  infant attachment studies 288–9
  intelligence 442–5, 460–1
  language transmission 206
  moral reasoning 259
  personality 423
  schemata 200–1
  self-esteem 408
  social comparison 409
Cutright, P. 495
cycle helmets 328, 329

D1/D2 receptors 90, 117
DA *see* dopamine
Dabbs, J.M. 429
'daily hassles' 533
Daley, Amanda 608–9
Dallos, Rudi 520–1
Daly, M. 420
Damasio, A.R. 130
D'Amico, A. 395
Dani tribe 200
Darby, K.M. 515
Darley, John 356, 358
Darwin, Charles 6, 7, 59–61
Das, J.P. 438
data analysis 542, 550, 564–5, 591, 599–600
data collection 541–2, 553–67
  developmental research 246–7
  levels of measurement 544–5
  model-testing 548–9
  null hypothesis 543
  populations/samples 565
  see also research methods
Data Protection Act 556
data summarising 568–85
database resources 631
Davey, Graham C.L. 464–538
Davidson, A.R. 321
Davis, B. 518
Davis, E.A. 270
Davis, J.M. 492
Davis, K.E. 335–6
Davis, L. 415
Davis, S.F. 384
Dawes, R.M. 226
Dawis, R.V. 453
Dawkins, Lynne 609
De Groot, A.D. 230
de Menezes, Jean Charles 180
De Renzi, E. 161, 196
De Valois, R.L. and K.K. 162
deaf children 269, 273, 275
death causes list 473
debating 51
DeBono, Edward 330
debriefing 313, 554
deception 313, 553, 554
decision criterion 170
decision-making 226–7, 358, 368–9
declarative knowledge 228, 616, 617
decoupling representations of objects 294
deduction principles 21
deductive reasoning 227–8
deep processing 190–1, 619, 628–9
defence mechanisms 511
degrees of freedom (df) 593, 594
Delgado, P.L. 491
deliberate attributions 340
deliberative processing 323
delta waves 131
demand characteristics 26, 546
demands, attentional 176–7
democratic leaders 373
demographic factors 531
demonic possession 465–6
demonology 466
dendrites 73
denial 11
DePaulo, B. 352
dependence 116, 119, 132
dependent variables 23, 547, 625
depolarisation 82, 84, 112, 137, 138, 145
depression 490–6
  bipolar disorder 491
  Bulimia Nervosa 122
  cognitive therapy 519
  dignity loss 467
  drug treatment 509–10
  major depression 491–4
  pain relationship 537

  psychopathology models 467–9
  reserpine 92
  serotonin 15
  suicide/parasuicide 494–6
  treatment efficacy 524
- deprivation effects 238
- depth perception 155–8, 165–6
- depth of processing 616
- Descartes, René 5, 7, 439
- description principles 21
- descriptive research 309
- desensitisation therapy 10
- design features of language 204–6
- designs for research
  - between-group design 38, 559
  - data analysis relationship 564–5
  - experimental 245–6, 556–61, 562–3
  - mixed design 560, 597–8
  - non-experimental 561–4
  - post-test only design 559–61, 593–5
  - report-writing 625
- desire theory 294
- Desjarlais, R. 471
- Desrosiers, A. 466
- determination coefficient 592
- determinism 15, 21, 46–8
- Detterman, D.K. 437–8
- Deutsch, J.A. and D. 172–3
- Deutsch, M. 365
- developmental dyslexia 214, 280–1, 283
- developmental psychology 234–300
  - adolescence 256, 257, 297–8
  - attachment 287–90, 291, 300
  - attitudes 318–19
  - autism 295–6
  - cognitive development 250–67
  - communication 268–83
  - environmental effects 238–41, 243–5, 275–8, 291
  - genetic effects 241–5
  - historical perspectives 236–8
  - identity 284–7, 298
  - language acquisition 268–78, 281
  - literacy 278–81
  - old age 76
  - psychobiology 56
  - research methods 245–7
  - self/relationships 284–300
  - terminology 235
  - theory of mind 292–5
- developmental stages *see* stages of development
- deviations 574–7, 579, 586–7
- df (degrees of freedom) 593, 594
- Diagnostic and Statistical Manual IV (DSM-IV) 473
- Diagnostic and Statistical Manual IV Text Revision (DSM-IV-TR) 473–5, 500–1
- Diamond, A. 253
- diathesis-stress view of schizophrenia 497
- diazepam 91, 132
- dichotic listening tasks 78, 170–1
- dichotomous traits 61
- Dickinson, A. 111
- diencephalon 76–80
- diet–intelligence relationship 448
- difference research 7, 33–5, 38–9
  - control group participants 558–9
  - gender 33–5, 259, 286–7, 297, 299
  - intelligence 445
  - languages 269, 279, 280, 281
  - personality 412–13, 429
  - sex differences 78, 96–8, 286, 429
  - statistical models 593–8
- diffusion of responsibility 356
- digit span tests 186, 188, 616
- dignity loss 467
- dimensions of DSM-IV-TR classification 473–4
- Dion, K. 349, 354
- Dion, K.K. and K.L. 354
- direct measurement of attitudes 320
- direct perception 165–6
- direct route to reading 213–14
- disabilities 473
- disclaiming 16
- discontinuity of development 236
- discounting principles 338
- discourse analysis 15, 16, 310–11, 487, 550
- discrete disorders 474
- discrete variables 545
- discrimination 103, 109, 374–6
- discriminative stimuli (SD) 103, 109
- discursive practices 16
- discussion section of reports 627
- disease model 466–9
- disgust reactions 380–1, 480
- dishabituation 268
- dismissive adults 290
- disorder spectrums (DSM-IV-TR) 474
- disorganised infants 289–90
- disorganised schizophrenia 496–7
- disparity, retinal 155, 156
- displacement 11, 206
- dispositional causes 334
- dissidents 470–1
- dissociation of function 188
- dissonance research 562, 599
- distal stimulus 151
- distance
  - cues to 156–7, 158
  - interpersonal distance zones 353
  - retinal size 152–3
- distinctiveness
  - configuration/covariation model 337
  - letter features 163
- distorted images 153
- distress 472, 473
- distributed practice 615
- distributions 568–78
  - autobiographical memory 196
  - chi-square test 599
  - parametric test assumptions 591
  - probability 576–8
  - shape of 575–6
  - standard error 586
  - *t*-distributions 593
- disulfiram 105
- divided attention 175–9
- divorce effects 291
- dizygotic twins 66
- DNA 61, 64–9
- Dobbing, J. 448
- doctor–patient communication 531–2
- doctors 134, 530–2
- Dollard, John 417
- Dolly the sheep 59
- domains 415, 429
  - *see also* paradigms
- dominant genes 243–4
- dominant traits 62
- Donald, M. 190
- Donaldson, M. 256
- donepezil 94
- dopamine (DA)
  - amphetamine effects 117
  - cocaine effects 117
  - LSD effects 119
  - MDMA effects 94
  - nicotine effects 118
  - Parkinson's disease 85
  - receptors 88
  - schizophrenia 90, 497–8, 509
  - sensation-seeking 67
  - synaptic regulation 90
  - synaptic transmission 84–5
  - synthesis/metabolism 86
- dopaminergic neurons 84–5
- dorsal column system 145
- double-bind hypothesis 498
- double deficit model of dyslexia 280–1
- double dissociation methodology 161, 188
- 'doubting' memory 486
- Down's syndrome 48, 49, 243
- downward comparison 409, 533, 536
- Dowson, M. 396
- Draper, R. 520
- DRD4 gene 67
- dream analysis 11, 132, 511
- drinking 122–3
- drive theory 367, 392
- drivers' sleep deprivation 134
- drugs
  - action 91–4
  - classification 91
  - discrimination 109–10
  - foetal development effects 239–40
  - habituation 100–1
  - misuse 115–20
  - neurotransmission 92
  - overdose 104
  - self-administration 116, 117, 118
  - sleep 132
  - tolerance 104
  - treatments 119, 508–10, 535
- Drury, J. 409
- DSM-IV (Diagnostic and Statistical Manual IV) 473
- DSM-IV-TR (Diagnostic and Statistical Manual IV Text Revision) 473–5, 500–1
- dual-process models 323, 366
- dual representation theory 490
- dual-route models
  - language acquisition 274–5, 282
  - literacy learning 278–80
  - reading out loud 213–14
- dual-task paradigm 177, 188
- dualism 5
- duality of patterning 204–5
- Duncker, K. 219
- duration of memory 184, 185–7
- dysfunctional personalities 412
- dyslexia 213, 214, 280–1, 283

- Eagly, A.H. 316, 317, 325
- ear 142–4
- Earles, J.A. 456

early selection models 172–3
eating disorders 122, 503–5
  aetiology 504–5
  biological factors 504
  biopsychosocial model 504–5
  diagnosis 503
  family therapy 520–1
  life experience factors 504
  psychological factors 504–5
eating mechanisms 120–2
Ebbinghaus, Hermann 5, 8, 194, 615
Eccleston, C. 537
echoic memory 184
ecological validity 460, 547, 563
economic factors 238–9
ecstasy (MDMA) 94, 119
ECT (electroconvulsive therapy) 508, 510
EDD (eye direction detector) 293
educational psychology careers 604, 605
Edwards, A.L. 317
Edwards, L. 61
EE (expressed emotion) 499–500
effect in population 586, 589–90
effect sizes 39, 590
effectiveness assessment of treatments 522–4
efferent nerves 71, 102, 147
efficacy expectations 395
effortful processing 192
ego 10–11, 511
ego-involved goals 396
ego-psychologists 418
egocentrism 255, 406
Ehlers, A. 482, 490
Eifert, G.H. 481
Eisikovits, Z. 388
Ekman, P. 381
elaboration likelihood model (ELM) 326–8, 330
elaboration mnemonics 193, 616
electric shocks 173, 370–2
electrical communication 81–3
electrical synapses 83
electroconvulsive therapy (ECT) 508, 510
electroencephalograms (EEGs) 131–2
electrostatic pressure 81
Eliza computer program 13–14
Ellenberger, H.F. 415
Ellis, Albert 519
Ellis, A.W. 161
ELM (elaboration likelihood model) 326–8, 330
embedded figures test 295, 296
embryology 61
emergencies 356–7, 358
Emerson, P.E. 288
emotion 125–35, 380–90
  avoidance 488
  brain 127–9
  characteristics 381
  functions 381–2
  measurement of 388
  numbing of 488
  theories 126, 387
emotional intelligence 447
emotional processing theory 489–90
Emotional Stroop procedure 484
empathy 355, 512
empathy-altruism hypothesis 355
empirical reports 578
empiricism 21, 236, 438
enactive representations 262
enactment effect 616
encoding
  limitations 260
  long-term memory 187, 191–3
  short-term memory 187
encoding specificity principle (ESP) 194, 616
encoding variability phenomenon 615
encounter group therapy 520
end-state problem solving 221
endocrine feedback 96
endocrinology 95–8
endophenotype 63
endorphins 88, 146
enmeshed adults 290
enquiry-based learning methods 623
environment
  behavioural changes 61
  behavioural self-control 518
  developmental effects 238–41, 243–5, 275–8, 291
  intergroup behaviour 374
  learning styles 620
  personality effects 422–3
  psychometric testing 460
  versus heredity 47, 48–50, 66
enzymatic metabolism 90
EPI (Eysenck Personality Inventory) 24
epinephrine *see* adrenaline
episodic memory 184, 196
epistemology 20
EPSP (excitatory postsynaptic potential) 82, 89
Epstein, R. 219
equilibration 251
equity theory 354, 355
Erickson, K. 352, 387
Ericsson, K.A. 616
Erikson, Erik H. 10, 33, 35, 39, 298, 416, 418
error bars 579–80
error words 210, 211
errors 180
  ‘A not B’ errors 252–3
  attribution 340–2
  hypotheses 589–90
  measurement error 544, 546
  sampling error 586, 587
  standard error 578, 579, 586–7
  trial and error strategies 219
ESP (encoding specificity principle) 194, 616
essays
  assessment criteria 625, 626–7
  planning 623–4
  writing 612, 617, 623–5
estradiol 98
ethics 29, 553–7
  animal/human research 57
  BPS guidelines 29, 57
  Milgram’s study 371
  observational methods 563
  social psychology 311–12
  token economy schemes 517
ethnicity 286, 445
ethnocentrism 32–3
ethnographic observations 247
ethology 44, 288
eugenics 48, 57, 431
European road rage 358
evaluation
  apprehension model 27, 367
  configuration/covariation model 337
  course evaluation 631
Evans, J. 218
event schemata 306
Everill, J.T. 504
evolutionary theory 6–7
  anxiety 91
  behavioural genetics 59–61
  criticisms 15
  learning theory contrast 100
  personality 429
  sleep 132–3
examination skills 612, 629–31
exchange errors 211
excitation transfer theory 385
excitatory neurotransmitters 85
excitatory postsynaptic potential (EPSP) 82, 89
executive functioning 253, 296
executive self 284, 285
exemplar model of concepts 200
exercise psychology careers 604, 608–9
existential self 284, 285
existential therapies 512
expectancy effects 28
expectancy theory 28, 111
  emotions 387–8
  motivation 394–5, 397
  person variables 422
  placebo effects 523
  randomised controlled trials 523–4
expectancy-value model 322, 395
expected utilities 226, 227
experience in childhood 236–7
experiential group therapy 520
experimental control 10, 13, 22–3, 28
experimental hypotheses 542–3, 588–9
experimental reductionism 44
experimental research 22–3, 37–8, 546–8
  designs 245–6, 556–61, 562–3
  developmental methods 245–6
  psychopathology 487
  social psychology 309–10
experimenter artefacts 27–8
expert witnesses 197, 607
expertise 229–30, 556
explanations 9, 44–6
  see also theories
explicit feedback 406–7
explicit knowledge 262
explicit level of representation 263, 264
explicit memory processes 184
exposure therapies 513–15
expressed emotion (EE) 499–500
expression-independent percepts 161
external locus of control 395–6, 527
external validity 25, 44
exteroceptive stimuli 109
extinction principle 103, 108, 109, 513–15
extracellular fluid 122
extracellular thirst 393
extraneous variables 558–9
extrapyramidal motor system 147–8
extreme case formation 16
extreme environments 238

extreme scores 571, 572, 573, 581
extrinsic motivation 397–8, 615
extroversion 23–4, 424–5, 428
eye direction detector (EDD) 293
eyes 136, 293
  see also vision
eyewitness testimony 197–8
Eysenck, Hans J. 24, 28, 415–17, 424–5, 428, 442–3, 523
Eysenck, M.W. 172, 179, 190, 202
Eysenck Personality Inventory (EPI) 24

face recognition 161, 164, 612
face validity 58–9, 458
facial expressions 381, 384
facial feedback hypothesis of emotions 384
factor analysis
  Greek five-factor inventory 460
  intelligence 441
  personality 426
  the self 406–7
factual knowledge revision 628–9
faculty psychology 6
FAE (fundamental attribution error) 341
failure, fear of 399
Fairburn, C.G. 487, 504–5
faking PTSD 489
false alarms 170
false autonomic feedback 385
false consensus effect (FCE) 341, 342–3
false memories 2, 489
falsifiability 21
family environment
  developmental effects 238–9, 243–5, 291
  eating disorders 504
family therapy 520–1
Farber, E.W. 495
Farrington, D.P. 502
faulty learning 513
Faustman, W.O. 498
Fava, G.A. 522
Fazio, R.H. 321, 323, 325
fear 380–1
  amygdala 128
  DRD4 gene 67
  of failure 399
  hippocampus 128–9
  punishment 107
  see also anxiety/anxiety disorders
fear appeals 330–1
fear hierarchies 513, 514
feature detection theory 160–2, 166
feature list theory 200
Fechner, Gustav 7
feedback
  emotional feedback 384
  endocrine feedback 96
  explicit feedback 406–7
  facial feedback hypothesis 384
  false autonomic feedback 385
  language acquisition 275, 276–7, 278
  study skills 631
Feldman, M.P. 515
feminist psychology 34, 40
Fernquist, R.M. 495
Ferster, C.B. 515
Festinger, Leon 324–5, 562, 599
fetishes 105
FI (fixed interval) schedules 108–9
Field, Andy P. 480, 539–601
field studies 310
Fight Club 11
fight or flight response 71, 91, 125, 126, 128
figure–ground separation 152
film criticism 11
filter model of selective attention 171–2
Findlay, K. 619
first impressions 345–8
Fischhoff, B. 397
Fishbein, M. 530
Fisher, K. 396
Fisher, Ronald 548
Fisher's criterion 587, 588, 589
Fisk, A.D. 170
Fiske, Susan E. 303–5, 307, 342
fissures 76
fit of models 549
five-trait theory 425–7
fixations 418–19
fixed differences 39
fixed interval (FI) schedules 108–9
fixed ratio (FR) reinforcement schedules 108
flashbacks 488
flashbulb memories 196, 198
Fleurose, S.S. 466
flight or fight response 71, 91, 125, 126, 128
flooding 513
Florin, I. 382
fluid intelligence 441, 447
Fluoxetine *see* Prozac
flying fear study 514
fMRI (functional magnetic resonance imaging) 15, 55, 128
Foa, E.B. 489–90
focal theory 298
focused attention 170–4
  auditory 170–1
  visual 173–4
foetuses 97–8
Folkman, S. 533
Forbes, G.B. 423
Fordyce, W.E. 536
forebrain 76–80, 132
forensic psychology careers 604, 605–6
Forer, B.R. 407
forgetting
  autobiographical memory 196–8
  long-term memory 187, 191, 194–5
  short-term memory 186–7
  see also amnesia
form, perception of 152–5
formal operations stage of development 256
formulation
  hypotheses 224
  language 210–12
fornix 79, 127
Försterling, F. 333, 334, 335
fortress problem example 220–1, 222
fossils 60
Fox, N.A. 253
Foy, D.W. 488
FR (fixed ratio) reinforcement schedules 108
Frances, A. 494
Francis, J. 407
Francis, W.N. 214
Franklin, J.A. 504
free association 11, 511
free riding 367
free will 12, 46–8
freedom to withdraw from research 554–5
Freeman, R. 438, 619
frequency data 599
frequency distributions 568–9
  histograms 568–78
  mode 570
  probability 576
  properties 568–9
  sampling variation 586
frequency of word effects 213–15
Freud, Anna 416, 418
Freud, Sigmund 194, 196, 415–16, 418–20, 469, 511
  adolescence 297
  child development 236–7, 287
  dreams 8, 132
  evaluation of theory 418–19
  motivation 392
  personality theory 414
  psychodynamic approach 10–12
  women 33
Friedman, A. 201
Friedman, H.L. 420–1
Friedman's ANOVA 596, 597
Frieze, I.H. 409
Frith, U. 279, 295, 296
Fromm-Reichmann, F. 498
frontal lobes 77, 79, 130, 133, 296
frontstage self-presentation 405
function words 211
functional analysis 515–16
functional fixedness 219, 220
functional-level syntactic planning 211
functional magnetic resonance imaging (fMRI) 15, 55, 128
functional personalities 412
functionalism 7
fundamental attribution error (FAE) 341
funding postgraduate training 605, 609
Furlong, M. 423
Furnham, A. 391, 457, 460
furniture representativeness 200–1
Fusella, V. 178, 179

g (general intelligence) 440–2, 446, 454
G-proteins 89
GABA 85, 87, 88, 91, 132
GAD *see* generalised anxiety disorder
Gaertner, S.L. 376
GAF (Global Assessment of Functioning) Scale 475
Gage, Phineas 79
Galen's theory 428
Galton, Francis 7, 8, 439, 440
galvanic skin response (GSR) 320
gambler's fallacy 226
gambling gene 67
games 258–9
ganglion cells 138
garden path sentences 209
Gardiner, J.M. 616
Gardner, Fiona 420
Gardner, Howard 438, 442–4
Gardner, R.A. and B.T. 206
Garner, D.M. 505
Garrett, M.F. 211
Garssen, B. 481
GAS (goal attainment scaling) 396

gate control theory 146, 536–7
Gathercole, S.E. 190
GB (government and binding) theory 273–5
gender
  child development 286–7
  difference research 33–5, 259, 286–7, 297, 299
  doctor consultations 531
  intelligence differences 445
  major depression 492
gender constancy 286
gender identity 286–7
gender stability 286
gene cloning 68
general intelligence (g) 440–2, 446, 454
general paresis 466
'general problem solver' model 221–2
generalisation
  external validity 25
  samples 38
  stimuli 103, 109
generalised anxiety disorder (GAD) 482–5
  aetiology 483–4
  biological theories 484
  chronic worry 483–5
  cognitive factors 484
  dispositions of worriers 485
  dysfunctional beliefs 485
  medical model of psychopathology 467
generation effect 616
generation gap factors 297
genetic engineering 57
genetics 54–70
  developmental effects 236, 241–5
  eating disorders 504
  intelligence acquisition 446–7
  minority influence model 366
  personality 429–31
  phobias 479
  see also heredity/heritability
genital stage of development 11, 419
genitals 97
genotypes 49–50, 62, 242–3
Genovese, Kitty 356, 357
geons 163–4
Gerard, H.B. 365
Gergen, K. 307
Gerrard, M. 533
Gesell, Arnold 237
Geshwind, N. 78
Gestalt principles 7, 152, 158, 166, 219–20, 512
Gestalt therapy 512
Gibbon, F.X. 533
Gibbons, R.D. 524
Gibson, James J. 157, 158, 165, 253
Gick, M.L. 220
Gilbert, D.T. 340, 341
Gilhooly, K.J. 218
Gilligan, C. 259
Gilliland, K. 428
Gilmore, J.H. 492
Gilovich, T. 405
glial cells 74–5
Glicksohn, J. 399
Global Assessment of Functioning (GAF) Scale 475
globus pallidus 80, 85, 147
glucocorticoids 131
glucogon 121
glucoreceptors 121
glucose 121, 131
glutamate 85, 87, 88, 112, 121, 137
glutamatergic neurons 84
glycogen 121
Glynn, S.M. 517
goal attainment scaling (GAS) 396
goal-setting 396, 619
goal theories 396, 397
Gobet, F. 230
Godden, D. 193–4
Goffman, Erving 405
Goldacre, Ben 470
Goldberg, D.P. 532
Golden, R.N. 492
Goldin-Meadow, S. 273
Goldsmith, S.K. 498
Goldstein, A.J. 482
Goleman, Daniel 447
good subject effect 26–7
Goodwin, D.W. 194
Gopher, D. 175–7, 178
Gopnik, A. 285
Gottesman, I.I. 497–8
Gottlieb, G. 446
Gough, B. 307, 311
Gough, D.A. 619
government and binding (GB) theory 273–5
government health interventions 527, 528
Gowers, S.G. 504
GP consultations 530–2
graduate skills 613, 617–18
graduated exposure 515
'graininess' 156, 157
grammar 207, 271, 272, 277
  see also linguistic rules
graphemes 278–80
graphs
  good practice 581–4
  histograms 568–78
  interactions 598
  means 579–80
  medians 580–1
  relationships 581–2
Gratch, G. 252
Gray, Jeffrey 428
Gray, N.S. 564
Greek culture 5
Greek five-factor inventory (NEO-FFI) 460
Greenwald, A.G. 318, 321, 322, 563, 599
Gregory, R.L. 155, 165
Greisberg, S. 486
Grice, H.P. 210
grid lines, graphs 583
Griffen, C. 429
Grilly, D.M. 498
Grosjean, F. 212
ground–figure separation 152
Grounded Theory 550
group therapies 515, 520–2
groups 362–78
  cognitive development 265
  conflict reduction 375–6
  decision-making 368–9
  definitions 362
  intergroup behaviour 374–6
  leadership 372–4
  membership 363, 375, 406
  negative interdependence 375
  norms 364
  performance 367–8
  polarisation 368–9
  pressure to obey 372
  processes 362–78
  size 367–8
  study skills 612–14, 618–19, 622–3
  types 363
groupthink 369, 370–2
growth hormone 133
GSR (galvanic skin response) 320
Guggenheim, F.G. 499
guide maps 629, 630
guided participation 265
Guilford, J.P. 441
Gump, B.B. 408
Guppy, A. 312
Gupta, N. 532
gustatory system 146
Guttman scale 320
gyri 76

H-Y antigen 97
habituation 100–1, 242, 254, 268
Hadlow, J. 532
Hagerty, M. 421
Haier, R.J. 446
hair cells 143–4
Haitians 471
Hall, Charles 8
Hall, E. 353
Hall, G. Stanley 237
Hall, J. 517
Halligan, P.W. 175
hallucinations 133
halo effect 346
haloperidol 90, 94
Halpern, D.F. 445
Halstead, W.C. 446
Hammersley, M. 549
Hancock, P.A. 460
handouts at lectures 620
handshakes 9, 45
Hanges, P.J. 445
Hanlon, C. 276
Hannay, D.R. 530
Happe, F. 296
Hardie, R.J. 396
Hare, R.D. 501
Hareli, S. 388
Hargrove, M.F. 429
Haridakis, P.M. 432
Harley, T.A. 202, 206–7
Harlow, H. 287
harm
  protection from 312
  risk of 554, 556
Harris, M. 294
Harris, P.L. 252
Harris, T. 429, 499
Harrison, J.A. 530
Harter, S. 298
Harvey, R. 523
Hasher, L. 192, 615
Haslam, N. 399, 501
Hastie, R. 349
Haugtvedt, C.P. 330
Haworth-Hoeppner, S. 504

Hawton, K. 495
Hayduk, L.A. 352
Haynes, R.B. 532
HD (Huntington's disease) 62–3, 80, 148, 244
Head Start programme 240
health belief models 528–30
Health Locus of Control Scale 527–8
health psychology 526–38
  careers in 604, 606–7
  definitions 526–7
  good psychological health 474–5
  motivation 391
  personality factors 432
  treating psychopathology 508–25
hearing development 268–70
Hearnshaw, L.S. 27
Hebb, D.O. 112, 392, 428–9, 446
Heckhausen, H. 395
Hedges, L.V. 445
Heider, Fritz 303, 324–5, 334–5
height debate 48
Heilman, H. 349
Hellawell, S.J. 490
helplessness theory of depression 493–4
Herbert, Camilla 607
Herbert, T.B. 532
heredity/heritability
  environment/heredity debate 47, 48–50, 66
  intelligence 244–5, 447
  personality 424, 430
  physiological approach 15
  see also genetics; inheritance; nature–nurture debate
Herman, C.P. 504, 505
Hernstein, R.J. 445
heroin 104
Herrmann, Robert A. 197
Herzog, D.B. 503
heteronymous morality 258, 259
heteroreceptors 90
heterosexism 39
heuristic systematic model (HSM) 326, 328, 329, 330
heuristics 221–2, 226, 230, 326, 328–30
Hewitt, P.L. 487
Hewstone, M. 330
hierarchical models 12, 191, 305, 421, 441
hierarchical organisation of memory 191
hierarchical representation 305
hierarchy of needs model 12, 421
Higgins, E.T. 403
Higher Education Academy Psychology Network website 631
Hildum, D.C. 318
Hill, A.J. 504
Hill, J. 488, 502
Hiller, M.L. 396
hindbrain 80–1
hippocampus 79–80
Hirsch, C.R. 405
Hirschfeld, R.M. 491
histograms 568–78
historical issues 4–52
  approaches to psychology 5–19
  bias 32–42
  psychology as science 20–31
  social psychology 303
Hitch, G. 179, 187, 189–90
'HM' case 184, 187–8
HM Prison Service careers 606
Hobbes, Thomas 5, 7
Hobson, R.P. 293
Hockett, Charles 204–5
Hodgkinson, S 491
Hodgson, R.J. 105, 486
Hofmeister, J.F. 516
Hogg, M.A. 302, 363–4, 365, 369
Hole, G. 547, 561, 564, 572, 575, 588
holistic therapies 512
Hollon, S.D. 519
Holmes, E.A. 488
Holmes, T.H. 533, 534–5
holophrases 271
Holst, V.F. 194
Holyoak, K.J. 220
Holzman, P.S. 419
Home Office 58, 109
homeostasis 104, 392–3
homogeneity of variance 591
homosexuality 8, 39
Honey, P. 620–1
Hooley, J.M. 500
hopelessness theory of depression 493–4
horizontal axis 569
horizontal cells 138
hormones 95–8
  activational effects 97–8
  aggression 130
  dysfunction in eating disorders 504
  hunger 394
  organisational effects 97–8
  personality 429, 431
  sex differences 96
  sexual motivation 398
  thirst 393
  types 95
Horn, John 441
horoscopes 2, 407
Hoskins, S. 615
hot weather effects 385
Hotopf, M. 427
Howitt, D. 40
Hoyenga, K.B. and K.T. 429
HSM (heuristic systematic model) 326, 328, 329, 330
Hubel, David H. 141, 160, 162–3
Hugdahl, K. 479
Hughes, Howard 486
Huguet, P. 367
Hull, A.J. 187
Hull, Clark L. 218, 223, 392
human error 180
  see also errors
Human Genome Project 59, 68–9
human language *see* language
human research 57–9
  see also research methods
humanism 12–13
  applications 421
  evaluation 12
  free will 47
  key features 12
  motivation 397
  personality 416, 420–1
  scientific method 29
  therapies 512
Hume, David 547
Humphreys, G.W. 159
Humphrys, G. 438
hunger 394
Hunt, Earl 442
Hunter, J.A. 341
Huntington's disease (HD) 62–3, 80, 148, 244
Hutchence, Michael 495
Huttunen, M. 240–1
Huxley, Aldous 321
hybrid disorders 474
Hyde, J.S. 445
hypercolumns 141
hypercomplex cells 162
hyperphagia 121
hyperpolarisation 82, 137, 138
hyperventilation model 481–2
hypnogogic hallucinations 133
hypnotherapy treatments 522
hypnotic drugs 132
hypomania 491
hypothalamic-pituitary portal system 96
hypothalamus 76
  aggression 130
  eating behaviour 120–2
  emotion 127
  endocrinology 95–6
  sexual differentiation 98
hypotheses 541–2
  definition 540–1
  exercises 546
  generating 542
  probability and 588–90
  testing 10, 223–5
  types 542–3
  see also predictions
hypothetical averages 38
hypothetical constructs 23–4
hypothetico-deductive method 22, 37
hypovolemic thirst 122

IAT (Implicit Association Task) 322, 563, 564, 599
Ibbotson, J. 391
ibotenic acid 121
ICD (*International List of Causes of Death*) 473
iceberg analogy 415, 418
iconic memory 173, 184–5
iconic representations 262
ICSS (intracranial self-stimulation) 116, 117, 118
id 10–11, 511
ideal self 12, 403
identity
  adolescence 298
  child development 284–7
  conflict 409–10
  crises 410
  deficit 409–10
  social identity theory 317, 365, 375, 404, 406, 409–10
identity-reference groups 363
idiographic research approach 414, 563
idiographic tests 454, 455
ignorance 356
ill-defined problems 218
illness 508, 526, 530, 532–7

  see also health psychology;
    psychopathology
'illness iceberg' 530
illusions 154–5
imitation 272
immediacy of authority figure 372
immediacy principle 209, 372
immediacy of victim 372
immunology 116
impairment definitions 472, 473
Imperato, A. 118
imperfection definitions 468
Implicit Association Task (IAT) 322, 563, 564, 599
implicit attitudes 318
implicit knowledge 262
implicit level of representation 263, 264
implicit memory processes 184
implicit personality theory 347
impossible events 254, 257
impression formation 325, 345–61
impression management 320, 325, 350, 352, 460
imprinting 100, 287
in-group identification 33
in loco parentis consent 554
in vivo microdialysis 118
inanimate objects 335
incentive salience 119–20
incentives 119–20, 393–4, 395
incidental learning 191–2
incompatible trials 563
incus 143
independence 32, 591
independent ANOVAs 595–6, 597
independent measures design 38, 559
independent *t*-test 593–4
independent variables 22, 547, 625
indirect measurement of attitudes 320–1
indirect route to reading 213–14
individual differences 7
  see also difference research
individualist identity 409
induction principles 21
inductive reasoning 222–7
industry, careers in 603, 608
infants
  attachment 287–90, 291, 300
  definition 235
  development 238, 239, 245–6, 251–4, 257
  eye direction detector 293
  language acquisition 268–78
  pretend play development 294
  self/identity development 284–5
  theory of mind development 293
  see also children
inferences 293, 565
inferior colliculi 80, 144
inflated responsibility factors 486, 488
influence 362–78
informal collaboration methods 619
information processing
  biases 484, 499
  theories 259–62
information skills 618
informational social influence 365
informed consent 313, 553–4
inheritance 7, 63–4
  developmental effects 242–3
  eating disorders 504
  schizophrenia 497
  see also heredity/heritability
inhibition of word recognition 166
inhibitory neurotransmitters 85
inhibitory postsynaptic potential (IPSP) 82, 89
initial impressions 345–8
initial-state problem solving 221
innate characteristics 272–3
insanity 465–6
insight 219
Insko, C.A. 319
insomnia 133, 523
instinct definition 392
instrumental (operant) conditioning 10, 105–10, 513, 515–19
insulin 121
intelligence 437–52, 453–63
  Army alpha/beta tests 35
  biological factors 446–7
  Burt's research 27
  constituencies 38
  contemporary issues 447–8
  definitions 437–9
  developmental research 243, 244–5, 246
  emotions 380–90
  life-span studies 246
  measurement 28
  minority groups 38–9
  motivation 391–402
  nature–nurture debate 66
  personality 412–36
  the self 403–11
  successful intelligence 630
  tests 8, 28, 35, 237, 440, 455–6, 459
intelligence quotient (IQ) 8, 28
  definition 440
  deviation from norm 470
  diet effects 448
  PTSD 488
  Wechsler tests 455–6
intentional interpreter effects 27–8
intentions
  attitudes 318
  inanimate objects 335
  planned behaviour theory 530
interaction graphs 598
interactive activation model 166
interference 187, 194–5
intergroup behaviour 374–6
intermediate-state problem solving 221
internal attention 173–5
internal consistency reliability 458
internal locus of control 395–6, 527
internal validity 25, 44, 523–4
International List of Causes of Death (ICD) 473
interneurons 102
interoception 145
interoceptive stimuli 109
interpersonal approach 415
  see also psychodynamic approach
interpersonal distance 352, 353
interpersonal experiences 265, 266
  see also social interaction
interpersonal intelligence 443
interposition 156–7
interpretation technique 511
interpretative repertoires 311
interpreter effects 28
interquartile range 573, 574, 580
interstitial fluid 122
intersubjectivity 285
interval data 544–5
  confidence intervals 578, 579–80, 587–8
  fixed interval schedules 108–9
  mean 572
  median 571
  parametric test assumptions 591
  reporting 578
  variable interval schedules 109
intervention of bystanders 356–7
interviews
  adult attachment 288–9
  children 247
  impression management 352
intimate distance 353
intracellular fluid 122
intracellular thirst 393
intracranial self-stimulation (ICSS) 116, 117, 118
intrapersonal intelligence 443
intravascular fluid 122
intrinsic motivation 397–8, 399, 615
introductory sections
  essays 624
  reports 625
introversion 424–5, 428
intuitive definitions of intelligence 438
Intute website 631
inverse agonists 91
inverse relationships of variables 581–2
inverted U-shaped curves 330–1
ion channel 81
ionotropic receptors 89, 138
ions 81
IPSP (inhibitory postsynaptic potential) 82, 89
IQ *see* intelligence quotient
Iraq war 316
Ireland, Jane 606
Isaacs, W. 517
Iwata, B.A. 515
Izard, C.E. 426

Jaccard, J.J. 321
Jack, S.J. 399
Jacobson, L. 562–3, 599
Jacobson, N.S. 513, 523
James, William 8, 126, 185, 190, 382
James–Lange theory 126, 382–5, 387
Janis, I.L. 369, 370
Janoff-Bulman, R. 488
Jarvella, R.J. 208
Jenike, M.A. 486
Jenkins, D.G. 532
Jensen, A.R. 446
Jenson, A. 448, 456
Jodeyr, S. 420
John, O.P. 426
Johnsen, B.H. 479
Johnson, D.L. 431
Johnson, J.G. 533
Johnston, T.D. 61
Johnston, W.A. 173
joint attention 270, 271, 282, 293

jokes 46
Jonah, B.A. 339
Jones, Dai 4–52
Jones, E.E. 335–6, 341, 348, 350
Jones, Marc 608, 609
Jones, R. 157
journals
  referencing articles 625
  reporting data 578–9
joy 380–1
judgement 225–7
Jung, Carl 10, 414, 416, 418, 424
jury membership 334
Just, M.A. 209
just world hypothesis 341, 355

K^+ (potassium) 81, 137
Kagan, J. 382
Kahn, A. 353, 354
Kahneman, Daniel 175, 178, 225–6, 304
Kandinski group 375–6
Kaney, S. 499
Kanfer, P.L. 455–6
Kanfer, R. 456
Kanizsa's triangle 37
Kanner, A.D. 533
Kant, Immanuel 439
Kaplan, M.F. 368
Karasawa, M. 354
Karmiloff-Smith, A. 263, 273
Katz, D. 317
Kaufman, J.C. 437
Kavanau, J.L. 133
Keane, M.T. 172, 179, 190, 202
Kebabian, J.W. 90
Keefe, F. 537
Kelley, H.H. 325, 336–8, 346–8, 363
Kelly, George A. 416, 417, 421–2
'KF' case 188, 189
Kiewitz, C. 432
Kinderman, P. 499
Kindt, M. 486
kinesthetic intelligence 443
King, D.W. 488
Kitayama, S. 354, 423
Kitzinger, C. 40
Klee group 375–6
Klein, D.F. 481
Klein, Melanie 420
Klerman, G.L. 510
Kluckhorn, C. 412
Klump, K. 504
Klüver, H. 127
Klüver–Bucy syndrome 127
Kneale, P.E. 619
knock-in technique 68
knock-on effect of arousal 385
knockout technique 68, 112
knowledge
  attitude functions 317
  expertise 230
  processes based on 180
  representing 198–202
  skill acquisition 228
  study skills 616–17, 628–9
  tests 456
  thinking 218
Koffka, Kurt 152
Kohlberg, L. 34–5, 257–9
Kohler, Wolfgang 152, 219
Kohut, Heinz 420
Koob, G.F. 117
Korabik, K. 391
Korchin, S.J. 524
Korsch, B.M. 532
Kozin, M. 196
Kracke, B. 297
Kramer, A. 447
Kringlen, E. 486
Krueger, R.F. 474
Kruglanski, A.W. 304
Kruskal-Wallis test 595–6
Kucera, H. 214
Kuhn, Thomas S. 21
Kulik, J. 196, 408
kurtosis of distributions 568, 569, 570

L-DOPA therapy 92
LaBar, K.S. 128
labelling
  effects of 564
  graphs 582
LaBerge, D. 174, 177
laboratory studies 246–7
LAD (language acquisition device) 272–3
Ladouceur, R. 485
Lage, E. 365–6
Laguerre, M. 471
Laing, R.D. 498
laissez-faire leaders 373
Lam, J.N. 515
Lamb, H.R. 509
Lambert, M.J. 523
landmines 106
Lange, Carl 126, 382–5, 387
Langer, E.J. 340, 341
language 204–17, 229
  acquisition 268–78, 281
  animal communication 204–7
  child development 237, 268–83
  cognitive development 265
  comprehension 207–9
  computer modelling 13
  design features 204–6
  determinism 48
  differences 269, 279, 280, 281
  poor comprehenders 281
  production of 209–12
  reading development 278–81
  specific language impairment 281
  spoken 212
  terminology 271, 272
  Wernike's area 78
  written 213–16
language acquisition device (LAD) 272–3
large numbers law 565
Larsen, R. 415
Last, J. 530
Latané, Bob 356, 358, 366
late selection models 172–3
latency period/latent stage 11, 419
latent learning 110–11
latent stage/latency period 11, 419
lateral geniculate nucleus (LGN) 140
lateral hypothalamus 120–1
lateral inhibition 138–9
lateralisation 78
Latham, G.P. 396
Latin square counterbalancing 596
Latino culture 471
Laurent, J. 459
Lavie, Y. 173
laws of
  averages 226
  effect 105, 106
  large numbers 565
  perceptual organisation 152, 158
  physics 254, 257
  pragnanz 153
Lazarus, R.S. 382, 387–8, 533
leadership
  behaviours 373
  groups 372–4
  situational perspective 373–4
  styles 373
  trait approach 372
learned helplessness theory 112, 493–4
learning/learning theory 10, 359
  animals 100–14
  attachment 287
  child development 237
  concept learning 223–5
  difficulties/disabilities 280–1, 470
  emotional experience 387
  gender roles 287
  language acquisition 268–78, 281
  literacy 278–81
  motivation 392
  psychopathology model 469–70
  sleep 133
  styles of learning 613–15, 619–21
learning curves 263
learning goals 617
learning outcomes 619, 629
Leary, M.R. 421
LEAs (local education authorities) 605
lectures 612, 620–2
LeDoux, J. 128–9
Lee, C. 505
Lee, W. 427
left brain 78
legislation 517, 556
Leiberman, A. 321
Leiter International Performance Scale-Revised 461
Lemere, F. 515
lemmas 210, 211
Lentz, R.J. 516
Leonard, N.H. 397
leptin 394
leptokurtic distributions 569, 570
Leslie, A.M. 294, 295
letter identification 162, 163
letter span activity 185
levels of
  explanation 44–6
  measurement 544–5
  processing 190–1, 195, 624
  variables 558–9
levels versus stages debate 263
Levelt, W.J.M. 209–10
Levenson, R.W. 382
Levy, S. 485
Lewin, Kurt 303
Lewis, C. 294
Lewis, M. 285
Lewis, Y. 404

lexical decision task 213–15
lexical route to learning 278–80
lexical selection 210
lexicalisation 210–11, 212
Ley, P. 192, 532
Ley, R. 481
LGN (lateral geniculate nucleus) 140
libido 511
librarian stereotypes 306–7
lie detection 57, 386
Lieberman, D.A. 110, 112
life events/experience
  eating disorders 504
  stress 533, 534–5
lifespan
  autobiographical memory distribution 196
  development across 235, 238, 246
  Erikson's theory 418
  intelligence across 447–8
lifestyle–health relationship 526–7
ligands 89
Likert scale 319, 320
liking relationships 353
limbic system 79–80
limited attentional capacity theories 175
line of best fit 581
line charts 579–80
linear perspective 155, 157, 166
lines experiments 364–5
linguistic intelligence 443
linguistic rules 271, 272, 274–5
linkage 64
Linton, M. 196, 198
Lippitt, R. 373
Lissauer, H. 159
literacy 278–81
'Little Albert' study 479
local education authorities (LEAs) 605
loci method 192
Locke, E.A. 5, 7, 396
Locke, John 236, 439
Lockhart, R.S. 190, 195
Lockwood, P. 409
locus of control 395–6, 527–8
Loeber, R. 502
Loftus, Elizabeth 197–9
logic, rules of 228
logical concepts 223
logical definitions of intelligence 438, 443
logical–mathematical intelligence 443
logical positivism 21
logogen model 215–16
logogen threshold 215
logographic stage of development 279
long-term memory (LTM) 184–9, 191–5
  capacity 185
  duration 185–7
  encoding 187, 191–3
  modal model 189
  recency effect 188
  STM distinction 185–9, 192
long-term potentiation (LTP) 112–13
longitudinal studies 246, 288, 442
Longman, D.J.A. 615
looking glass self 406
Lord, R.G. 363
Lorenz, Konrad 100, 287
loss aversion 226
love 130, 353, 355, 356
loving relationships 353
low birth weight effects 239
lower quartile 573–4, 580
LSD 119
LTM *see* long-term memory
LTP (long-term potentiation) 112–13
Luchins, A.S. 348, 349
Luchins, E.H. 219, 221, 348, 349
Luckmann, T. 307
Luria, A.R. 79, 446
Lusher, J.M. 67
Lutzker, J.R. 518
Luzzatti, C. 175
Lynn, R. 444
Lyubomirsky, S. 504

McCain, G. 415
McCall, R.B. 448
McClelland, David 399
McClelland, J.L. 166
McCoul, M.D. 399
McCracken, L.M. 537
McCrae, R.R. 415, 416, 425–7
MacCulloch, M.J. 515
MacDonald, D.A. 420–1
McDonald, W.T. 194
McDougall, William 392
McFadden, M. 307
McGarrigle, J. 256
McGaughey, T.A. 353, 354
McGeogh, J.A. 194
McGhee, P. 311, 322
McGuire, W.J. 330–1
machine reductionism 44
McInerney, D.M. 396
McIntosh, D.N. 384
McKay, D. 486
McKenna, E. 622
MACL (Mood Adjective Checklist) 388
MacLeod, C. 484
McNally, Rich J. 479, 488, 489
McNeill, D. 210, 211
McRae, A.L. 515
Macrae, C.N. 304, 308, 510
Madden, T.J. 530
'madness' 465–6
Maehr, M. 396
magnocellular layer 140, 141
Magnusson, D. 297
Maguire, E.A. 80
Maheswaran, D. 329
Mahoney, M.J. 517
Maiden, R.J. 427
Maiman, L.A. 529
Main, M. 289–90
mainstream view of attitudes 17
major depression 491–4
  biological causes 491–2
  cognitive theory 492–4
  gender issues 492
  psychological factors 492–3
majority influence 364
  see also conformity
Mak, A.S. 432
Maki, R.H. 615
maladaptive behaviours 472
malapropisms 210–11
Malim, T. 44
malleability of biological factors 447
malleus 143
Malloy, M.H. 448
mamillary bodies 79, 127
Mandler, G. 191
mania/manic depression 491
manipulating variables 546, 558–9, 595
Mann, J.J. 495
Mann, L. 369, 370
Mann-Whitney test 594
MAO (monoamine oxidase) 429
MAOIs (monoamine oxidase inhibitors) 94, 492, 509
mark schemes for essays 626–7
Marr, D. 162–3
Marsh, Richard 628
Marshall, J. 175, 214
Marshall, M.A. 407
Marslen-Wilson, W.D. 212
Martin, J.A. 518
Martin, P. 563
Martin, R. 330
Maslow, Abraham 12, 397, 416, 421
Masters, M.S. 445
mastery goals 396
Matarazzo, J.D. 526
matched design 559
maternal AAI classifications 289–90
maternal behaviour 59
  see also caregivers; prenatal development
mathematical intelligence 443
Mathews, A. 484, 513
Matsumoto, K. 112
maximum performance tests 456
Mayer, D. 445
Mazaleski, J.L. 515
MCH (melanin-concentrating hormone) 121
MDMA (ecstasy) 94, 119
ME (myalgic enphalomyelitis) 531
Mead, G.H. 406
mean 571–2
  APA conventions 579
  confidence intervals 587–8
  graphing 579–80
  probability 577
  standard error 586–7
  variance 574–5
meaning maximisation skills 614, 615–16
means-end analysis 222
measurement 23, 28, 543–6
  attitudes 319–23
  effect size 590
  emotions 388
  levels of 544–5
  variability 575
measurement error 544, 546
measures of central tendency 570–5, 578
mechanoreceptors 145
media effects 468, 504
medial dorsal nuclei 144
medial geniculate nucleus (MGN) 144
medial prefrontal cortex (mPFC) 112
median 571–2
  APA conventions 579
  graphing 580–1
  range calculation 573
median preoptic nucleus (MPN) 123
medical instructions study 192
medical models 466–9, 526
medulla 81

Meins, E. 294
meiosis 63–4, 65
melanin-concentrating hormone (MCH) 121
Meltzoff, A.N. 253, 284–5
Melzack, R. 146, 536–7
membership of groups 363, 375, 406
memory 183–203
  animal cognition 111
  attention 179
  children 260
  deficits in OCD 486
  exercises 195
  false memory effects 2
  feature detection theory 160
  implicit attitude associations 322
  models of 189–91
  object recognition 164
  reading/vocabulary development 280
  recovered trauma memories 489
  sensory 173
  sentence constituents 208
  systems overview 183–4
  template matching 158
  unilateral visual neglect 175
  visual object agnosia 159
memory-based learning 615–16, 624, 630
Mendel, Gregor 61–3
meninges 72, 74
menstrual cycle 78, 96
mental defeat 490
mental disorders 473
  see also psychopathology
mental health practitioners 469
  see also health psychology
mental lexicon 212
mental set 219, 220–1
mental tests of intelligence 440
Menzies, R.G. 479
mere exposure effect 318, 354
mesencephalon 80
mesolimbic pathway 116
mesolimbic system 90
messenger ribonucleic acid (mRNA) 66
Messer, David J. 234–300
metabolic inhibition 94
metabolites 90, 105
metabotropic receptors 89, 138
metacognition 620
Metalsky, G.I. 493–4
metarepresentations 294
metencephalon 80–1
method of loci 192
methodological bias 37–8
methodology 20
  behaviourism 10
  constraints 37–8, 94
  molecular biology 67
  science 20, 22
  section of report 625
  see also research methods
methylphenidate 94, 133
Meyer, D.E. 200, 215
Meyer, J.M. 504
MGN (medial geniculate nucleus) 144
Michaud, C. 532
microgenetic studies 262, 263
microtubules 84
midbrain 80, 81
middle ear 143
Mikhliner, M. 488
Miles, J. 566
Milgram, Stanley 29, 311, 320, 369–72, 553
Mill, John Stuart 547, 556
Millar, Neal 417
Miller, D.T. 340, 341
Miller, George A. 8, 185
Miller, L.J. 461
Miller, L.T. 443
Milner, P. 116
mindblindness 295
mindmindedness 294
minimal group paradigm 375
minority groups 38–9, 365–6
Minuchin, S. 504
Mischel, Walter 412, 417, 422, 427
mitosis 63–4, 75
Mittelman, M.A. 381
mixed ANOVAs 597–8
mixed (mixed-plot) design 560, 597–8
Mizell, C. 404
mnemonics 192–3, 616
moclobemide 94
modal model of memory 189–90
modality-specific resources 179
mode 570–1, 572
MODE model 323
models
  deviations 574
  differences 593–8
  fit of 549
  relationships of variables 591–3
  testing 548–9
  see also individual models
modular view of language 273
Mogg, K. 484
molecular biology 61, 66–8
molecular genetics 431
money as motivation 391
monoamine oxidase (MAO) 429
monoamine oxidase inhibitors (MAOIs) 94, 492, 509
monoamines 82, 429
monocular cues 155–7
monozygotic twins 66
Monteil, J.M. 367
Montgomery, S.A. 510
Mood Adjective Checklist (MACL) 388
mood-dependent memory 194
mood disorders 490–6
  bipolar disorder 491
  depression 490–6
  major depression 491–4
  SAD 490
  suicide/parasuicide 494–6
mood effects 460
Moore, M.K. 284–5
Moore, Simon 379–463
Moos, R.H. 533
moral development 34
moral judgements 257–9
moral realism 259
moral reasoning 258, 259
moral subjectivism 259
Moray, N. 172
Moreland, R.L. 353–4
Moreno, F.A. 491
morphemes 271
morphosyntax 271
Morrison, A.P. 499
Morton, J. 215
Moskovici, Serge 303, 365–6
Motes, M. 629, 630
motherese (child-directed speech) 275, 276, 278
motion cues 157
motion parallax 157
motivated forgetting 194
motivated tactician theory 304
motivation 115–24, 130, 391–402
  attribution models 338–9
  careers 604
  definition 392
  inanimate objects 335
  intelligence differences 445
  study skills 615
motor control 136–49
Mount, M.K. 457
mouth 146
mPFC (medial prefrontal cortex) 112
MPN (median preoptic nucleus) 123
mRNA (messenger ribonucleic acid) 66
MS (multiple sclerosis) 83
Muchinsky, P.M. 421
Muller–Lyer illusion 154, 155
Mullerian system 97
multidisciplinary approaches 54–6
multimodal distributions 571
multiple intelligences 440, 443, 444
multiple necessary cause schema 338
multiple regression 565, 593
multiple resource theory 177–80
multiple sclerosis (MS) 83
multiple sites of action 94
multiple sufficient causal schema 337
Mumford, A. 620–1
murder 130, 356, 357
Murphy, C.M. 247
Murray, C. 445
Murray, H. 412
muscles 148
musical intelligence 443
mutations 65, 243
myalgic enphalomyelitis (ME) 531
myelencephalon 80–1
myelin sheath 74, 82–3
Myers, D.G. 368
Myers, L.B. 418
Mylander, C. 273

Na^+ (sodium ions) 81, 137
NA *see* noradrenaline
NAcc (nucleus accumbens) 116, 117, 118
Naffrechoux, M. 365–6
naive scientists 303, 334
name unit of face recognition 161
narcolepsy 133
narrative therapy 512
nasal membrane 144
National Health Service (NHS) 604, 605
nativists 236
natural concepts 223, 225
natural intelligence 443
natural selection 6, 60
nature–nurture debate 66
  child development 236–7, 243, 244–5
  intelligence 243, 244–5
  language acquisition 269

  see also heredity/heritability
Navon, D. 178
Nazis 36, 57
‘need for cognition’ factor 330
needs hierarchy 12, 421
negative emotions 381
negative interdependence 375
negative punishment 107
negative reinforcement 10, 106–7, 119
negative relationship variables 581–2
negative state relief theory 355
negative symptoms 90, 497
negative triad 493–4
negatively skewed distributions 569, 570
Neisser, U. 8, 157–60, 163, 194, 196
Nelson, K. 196
neo-analytic perspectives 498–9
NEO-FFI (Greek five-factor inventory) 460
neo-Pagetian approach 262
neocortex 77
neoteny 37
nerve agents 92
nerve growth factor (NGF) 75
nervous systems 71–99, 136, 382
Neugebauer, R. 466
neural networks 277–8
neural tube 75
neuroanatomy 76–81
neuroendocrine dysfunction 504
neurogenetic determinism 44, 47
neurological effort 446
neuromuscular junction (NMJ) 148
neurons 71–99, 112–13
neuropeptide Y (NPY) 121
neurophysiology 162
neuropsychology
  careers in 604, 607
  face recognition 161
  memory 187–9
neurosecretory cells 96
neuroses 11
neuroticism 415, 424–5
neurotransmitters
  depression 491–3
  drugs 92
  hormone comparison 95
  metabolism 87
  neurons 74
  physiological approach 15
  reflexes 102
  retina 136
  schizophrenia 497–8
  sleep 132
  synaptic transmission 83–90
  synthesis 87
new paradigm research 29–30
New York Times 357
Newcombe, F. 214
Newell, A. 221–2
Newstead, S.E. 615, 619, 620
Newton, Isaac 563
NGF (nerve growth factor) 75
NHS (National Health Service) 604, 605
Nicholls, J.G. 396
nicotine 67, 94, 118–19
  see also smoking
nigrostriatal pathway 121
Nisbett, R.E. 303, 337, 341, 423
Niskanen, P. 240–1
Nissen, M.J. 174
NMDA receptors 112–13
NMJ (neuromuscular junction) 148
nociception 146
nodes of ranvier 74, 82
nominal data 544, 571, 599
nomothetic research approach 414, 563
non-associative fear acquisition 479
non-common effects 336
non-competitive drugs 91–2
non-conscious processes 169
  see also unconscious processes
non-experimental methods 245–6, 310, 561–4
non-rapid eye movement (non-REM) sleep 132
non-scientific statements 541–2
non-shared environments 243, 244–5
nonverbal behaviour/communication 350–3
non-word repetition 190
noradrenaline (NA) 84
  receptors 88
  sleep 132
  stress 131
  synthesis and metabolism 86
norepinephrine 491–2
normal distribution 454, 568, 570, 576–8, 591
Norman, D. 79, 112, 172
normative social influence 365
normative tests 454–5, 458
norms 39, 364, 409, 470–1
northern blots 68
Northrup, J. 515
note-taking skills 612, 620–2, 624
novelty-seeking (NS) 67
novices 229, 230
Nowell, A. 445
Noyes, R. 484
NPY (neuropeptide Y) 121
NS (novelty-seeking) 67
nucleotides 65
nucleus accumbens (NAcc) 116, 117, 118
null hypothesis 542–3, 588–9, 590
numeracy skills 618
numerical data
  reporting 579
  summarising 570–2
  testing theories with 548–9
  see also quantitative research; statistics
Nussbaum, D. 432

obedience 364, 423
  group pressure 372
  immediacy of victim/authority figure 372
  key factors 372
  Milgram’s experiment 29
  participant artefacts 27
  persuasion 372
  to authority 369–72
obesity 122, 518–19
object agnosia 157, 159
object permanence 252–3, 254, 257
object recognition 162–5
object relations theory 420
object size/retinal size 153
objective personality tests 456
objectivity 38–9, 453, 456, 457
observational methods 540–1, 563, 564
  bias 37
  child development 247
  gender differences 287
  personality research 414
  self 287, 404–5
observer effects 27
obsessive-compulsive disorder (OCD) 485–6, 488
occipital lobe 77
occupational psychology careers 604, 608
OCD (obsessive-compulsive disorder) 485–6, 488
O’Dwyer, A.M. 504
Oedipus complex 11
Oei, T.P.S. 423
off-centre cells 137
offending-behaviour programmes 606
Ogden, J. 535
Ogden, W.C. 174
Olds, J. 116
O’Leary, K.D. 513
olfaction 144
Olfson, M. 510
Ollendick, T.H. 524
Olweus, D. 290, 291
on-centre cells 137–8
One Flew Over the Cuckoo’s Nest 510
one-tailed hypotheses 543
one-tailed tests 589
one-way independent ANOVA 595–6
one-way related ANOVA 596–7
ontology 20
‘openness’ trait 426
operant conditioning 10, 105–10, 513, 515–19
operationism 23–4
operations of problem solving 221
opportunity sampling 566
opsins 137
optic chiasm 140
optic nerve 137, 139–40
optical flow pattern 157–8
optimistic bias 2, 527
oral presentation skills 622, 623
oral stage of development 11, 419
order in science 21
ordinal data 544, 571
ordinate axis 569, 582, 583
O’Reilly, M.F. 515
orexin 121, 133
organ of corti 143
organic factors 49
organisation of memory 191–2
organisational hormone effects 97
organisational skills checklist 618
orienting response 101
The Origin of Species (Darwin) 59
Orne, M.T. 26
orphanages 238
orthographic stage of development 279
orthography 213
osmoreceptors 122
osmosis 393
osmotic thirst 122
Osnes, P.G. 517
ossicles 143
Ouellette, J.A. 323
ought self 403
out-group 33

outcome expectations 395
outcome variables 548, 593
outer ear 142
outliers 571, 572, 573, 581
oval window 143
overdose 104
overeating 122
overlapping waves theory 262
overt attention 173
Owusu-Bempah, J. 40

p-value 588, 590
PAG (periaqueductal grey) 80, 146
pain 532–3, 535–7
  biomedical model 526
  cognitive models 537
  control 146, 536–7
  gate control theory 536–7
  perception 146
pain anxiety 537
Palladino, J.J. 384
pallidotomy 147
Palmer, S.E. 164
PANAS (Positive and Negative Affect Schedule) 388
Panayiotou, G. 460
panic attacks 480–2
panic disorder (PD) 480–3
  aetiology 481
  biological theories 481
  cognitive behaviour therapy 519–20
  hyperventilation model 481–2
  psychological theories 481–2
  situational phobias 480
Paolini, S. 376
Papadopoulos, Linda 605
Papageorgiou, C. 485
Papez circuit 127
Papez, J.W. 127
Papp, L.A. 481
paradigms 21, 223–4, 413, 415–32
parallel comparisons 160
parallel distributed processes 277–8, 280
parameters of language 273–5, 277–8
parametric test assumptions 591, 594, 597
paranoid schizophrenia 496–7, 499
parasuicide 494–6
parasympathetic nervous system 71, 73
paraventricular nucleus (PVN) 121
parietal lobe 77
Park, B. 349
Parker, D. 358
Parkes, C.M. 533
Parkinson's disease
  basal ganglia 80, 88, 148
  dopamine hypothesis 498
  emotional experiences 386
  inhibitory/excitatory pathways 85
  L-DOPA therapy 92
  nigrostriatal pathway 121
  pallidotomy 147
parsimony 21
parsing 208
partial agonists 91
partial correlation 592, 593
partial reinforcement 108
partial report condition 185
participant artefacts 26–7
participant section of reports 627
parvocellular layer 140, 141
Pashler, H. 615
Passer, M.W. 194
patient–doctor communication 531–2
pattern recognition 157–62
Patterson, M.L. 352
Paul, G.L. 516, 523
pause time in language 209
Pavlov, Ivan 8, 10, 100, 102–4
payment for research participation 554, 562
PCR (polymerase chain reaction) 68
PD *see* panic disorder
PDP (personal development planning) 619
Pearson, Karl 548, 591
Pearson's chi-square test 599
Pearson's *r* 590, 591–2
Pederson, N.L. 430
peer interactions
  bullying behaviour 290–2
  cognitive development 257, 265
  eating disorders 504
  pro-social behaviour 290
  theory of mind development 294
peer pressure 504
peers, definition 235
Pendleton, D. 530–2
pendulum problem activity 220
penis envy 11
Pennebaker, J.W. 421
Pennington, D. 305, 336, 420
perceived self 12
  see also self-perception
perception 151–68
  bottom-up/top-down processes 165–6
  equity/inequity in relationships 355
  exercises 158
  of form 152–5
  Health Belief Model 529
  Kanizsa's triangle 37
  person variables 422
  of self 12, 319, 325–6, 405, 407–8
  sensation distinction 151
  of words 215
percepts 154, 157–8, 161, 165–6
perceptual organisation laws 152, 158
perceptual sensitivity 170
perceptual systems 74, 136–49
perfectionism 485
performance
  attention 179
  groups 367–8
  motivation 393–4, 396–7
performance goals 396
periaqueductal grey (PAG) 80, 146
peripheral nervous system (PNS) 71
peripheral traits of words 346
Perkins, K.A. 110, 532
Perls, F. 512
permastore durability 185–6
Perner, J. 293
person approach to errors 180
person-centred therapy 12
person identity unit of face recognition 161
person-positivity bias 348
person schemata 306
person variables 422
personal construct theory 421–2
personal development planning (PDP) 619
personal distance 353
personal information research 556
personal self 403
personal skills 623
personality 412–36
  conscious/unconscious processes 415–20
  definitions 412
  descriptions 2
  development stages 418
  emotions 380–90
  functions 420–7
  genetics 68
  intelligence 437–52
  motivation 391–402
  prejudice and 374
  psychometrics 453–63
  the self 403–11
  structure 511
  tests 456–7
personality disorders 499–502
perspectives 413–15, 429
persuasion 315
  elaboration likelihood model 326–8, 330
  heuristic systematic model 328
  obedience 372
  polarisation through 369
  processes 326–8
persuasive communication model 326
PET *see* positron emission tomography
Peterson, C. 412
Peterson, L.R. and M.J. 186
Peterson, S.E. 174
Pettigrew, T.F. 341, 376
Pettito, L.A. 206
Petty, R.E. 316, 317, 326–7, 330
PGO waves 132
phallic stage of development 11, 419
phantom limb phenomenon 535–6, 537
pharmacodynamics 91
pharmacokinetics 91
pharmacotherapies 508–10
PhD qualifications 609
phenomenological paradigm 420–1
  see also humanism
phenothiazines 497
phenotypes 49, 62, 243
phenylketonuria (PKU) 48, 63, 242, 244
philosophy 5
phobias
  agoraphobia 480–1
  classical conditioning 103
  fear hierarchies 514
  specific phobias 478–80
phonemes
  language acquisition 268–70
  reading development 278–80
  restoration effect 165
phonological awareness 269–70, 279–81
phonological confusability 187
phonological core hypothesis 280
phonological encoding 187
phonological form of lemmas 211
phonological loop 190
phonological route to reading 213
phonological specification 211–12
photoreceptors 136–7, 138
phrase structure 208
phrenology 6
physical law violation 254, 257
physiological approach 6, 14–15

  emotion 126, 381–7
  evaluation 15
  handshake 9
  illness 508, 526, 532–3
  key features 15
  pain 526, 535–6
  reductionism 44
  see also biological factors
physiological arousal 382
  see also arousal theory
physiological reductionism 44
Piaget, Jean 8, 237–8, 251–9, 264–5, 623, 629
Piasecki, T.M. 474
Pichert, J.W. 202
pidgin languages 273
Piliavin, J.A. 356
Pilkington, C.J. 409
Pine, K.J. 263–4
Pittman, T.S. 350
Pitts, M.K. 527, 532
pituitary gland 76, 95–6, 97
PKU (phenylketonuria) 48, 63, 242, 244
placebo effects 523
plagiarism 627–8
planned behaviour theory 322–3, 530
plans
  essays 623–4
  person variables 422
  reflective practice 619
  revision 630
  study 619, 623–4, 630
platykurtic distributions 569, 570
play 398
Plies, K. 382
Plomin, Robert 417
pluralistic ignorance 356
Plutchik, Robert 380–1
PNS (peripheral nervous system) 71
podcasts 622
polarisation 81, 368–9
political dissidents 470–1
Polivy, J. 504, 505
Polson, P.G. 616
polygraphs 57, 386, 388
polymerase chain reaction (PCR) 68
polymorphisms 65
Ponomarenko, V.A. 448
pons 80–1, 132
Ponzo illusion 154, 155
‘poor comprehenders’ 281
Popper, Karl 21, 542
populations 565
  central tendency measures 572
  effect in 586, 589–90
positional-level syntactic planning 211
positive emotions 381
Positive and Negative Affect Schedule (PANAS) 388
positive punishment 107
positive reappraisal 533, 536
positive reinforcement 10, 106–7, 119
positive relationship variables 581–2
positive self-image 408–9
positive symptoms 90, 497
positively skewed distributions 568–9, 570
positivism 21, 307
positivity bias 407
positron emission tomography (PET) 55, 56, 80
  fear 128
  pallidotomy 147
  personality research 431
  psychobiology 55, 56
  taxi drivers 80
Posner, M.I. 170, 173–6
post-conventional morality 34
post hoc tests 595, 597
post-test only design 559–61
  ANOVAs 595
  t-tests 593, 594
post-traumatic stress disorder (PTSD) 488–90
postgraduate training 604–5, 609
Postle, B.R. 187
postsynaptic potentials 82
potassium 81, 137
Potter, Jonathan 310, 351
Poulton, R. 479
Povinelli, D.J. 285–6
power
  influence 363–4
  sources of 363
  tests 456, 590
PPT (principles and parameters theory) 273–5, 277–8
PR (progressive ratio) schedules 117
practical intelligence 445, 630
practice 176–7, 179, 180
practice effects 559
pragmatist learning style 620–1
pragnanz laws 153
Pratt, J.A. 110
Pratt, P. 485
pre-conventional morality 34
pre-operational stage of development 255
pre-test/post-test design 560–1, 563
preconscious mental processes 10, 418
pre-conventional morality 34
precursor drugs 92
predictions
  healthy behaviour 527, 528–9
  scientific 20, 21–2
  see also hypotheses
predictive validity 58, 458
predictor variables 548, 593–8
prefrontal cortex 130
prejudice 374–6
premotor cortex 147
prenatal development
  drug effects 239–40
  genetics 241–3
  maternal stress effects 240–1
pre-operational stage of development 255
prerequisite skills 613
preschool child development 255, 257, 292–5
presentation skills 618, 622, 623
pretend play 293–4
preterm babies 239
pre-test/post-test design 560–1, 563
Prill, K.A. 447
primacy effect 187, 208, 348, 349
primary appraisal of stress 533
primate communication 206–7
priming 200, 213–15, 321, 351
priming task 213, 214, 215
principles and parameters theory (PPT) 273–5, 277–8
Prison Service careers 606
prison study 312
privacy rights 312
private conformity 365
pro-social behaviour 290, 355–7
proactive interference 194–5
probabilities
  chi-square test 599
  hypotheses 588–90
  judgements based on 225–6
  z-scores 576–8
Probation Service careers 606
problem solving 218–22, 227
  analogies 220–1
  barriers to success 219–20
  early theories 218–19
  GAD 485
  psychometric testing 460
  study skills 618, 623
procedural knowledge 616–17
procedural memory 184
procedural-stage skill acquisition 177, 228–9
procedure section of reports 627
processing levels
  impression formation 349–50
  memory model 190–1, 195, 624
  study skills 616, 624
processing routes 326, 330
productive strategies 219
professional achievement 399
professional health care 530–1
professional training 605, 607, 610
programmed instruction 10
progressive ratio (PR) schedules 117
projective tests 456–7
properties of frequency distributions 568–9
proprioception 145
props for self-presentation 405
pro-social behaviour 290, 355–7
prosopagnosia 161
prospective studies 487
protection of participants 312, 556
protein hormones 95
protein synthesis 66
proteins 64–6, 95
prototype model 200, 201
proxemics 352, 353
proximal stimulus 151
proximity principle 152, 153
Prozac 15, 94, 122, 509, 510
Pryor, J.B. 341
pseudo-word superiority effect 165
psychiatry/psychiatrists 466, 469
psychoanalysis 10–12, 415–16, 510–12
  appraisal of 511–12
  falsifiability 21
  film criticism 11
  handshakes 9
  historical issues 7
  psychopathology model 469
  techniques 511
psychobiology 53–149
  animal learning/cognition 100–14
  brain 71–99
  emotion 125–35
  motivation/behaviour 115–24
  motor control 136–49
  neurons/nervous system 71–99

  perceptual systems 136–49
  sleep 125–35
  subdivisions 56–7
psychodynamic approach 10–12
  determinism 47
  evaluation 11–12
  key features 10–11
  personality 415–16
psychological characteristics 50
psychological models of psychopathology 469–70
Psychological Society of Great Britain 7
psychological tests 454
  see also tests
psychologists
  careers 603–11
  definition 469
psychology
  approaches 5–19
  curriculum 2–3
  early schools 7
  emergence 6–7
  forerunners 6
  historical issues 5–8, 43
  issues/debates 43–52
  potential 1
  as science 20–31
  scope 1
  statutory regulation 610
The Psychology of Interpersonal Relations (Heider) 334
Psychology Wiki website 631
psychometric approach
  intelligence 440–2, 445
  personality 425
psychometric testing 453–63
  categories 454–5
  principles 457–61
  problems 459–60
  types of test 454–7
psychopathology 464–538
  anxiety disorders 478–90
  basic issues 465–77
  causes 478–507
  classifying disorders 472–4
  defining behaviours 470–2
  eating disorders 503–5
  good psychological health 474–5
  models 465–70
  mood disorders 490–6
  personality disorders 499–502
  schizophrenia 496–501
  treatments 508–25
psychopathy 501
psychopharmacology 90, 91–4, 100
psychophysics 151
psychophysiology 57
psychosexual development stages 11, 418–19
psychosis 496–8
psychosocial moratorium 298
psychosomatic illnesses 532
psychotherapies 510–12, 524
psychotherapist definition 469
psychoticism 424–5
PsycInfo database 631
PTSD (post-traumatic stress disorder) 488–90
puberty 297
public conformity 365
public distance 353
public service employment 603
punishment 107, 518
pure experiments 23
pursuit rotor task 175
PVN (paraventricular nucleus) 121
pyramidal motor system 147

qualitative research 487, 549–50, 625
quantitative research 548–9, 625
  see also statistics
quartiles in range 573–4, 580
quasi-experimental research 23, 39, 561, 589
questionnaires 388, 487, 544
Quine, L. 328, 329
quota sampling 566

Rachman, S. 105, 486, 488
racial differences 445
racism 16, 35–7
radiation problem example 220–1, 222
Radomsky, A.S. 486
Raffi, A.R. 504
Rahe, R.H. 533, 534–5
Rampello, L. 492
Ramsey, C.T. 285
Ranaldi, R. 117
Randazzo, A.C. 133
random sampling 558, 560, 565
randomised controlled trials (RCTs) 523–4
range 573–4, 580–1
ranked data 592
raphe nuclei 132, 146
rapid eye movement (REM) sleep 132, 133
ratio data 545, 571, 572
Rational-Emotive Therapy (RET) 519
Raven, B.H. 363–4
Raven's progressive matrices 461
Rawlings, D. 399
Rayner, R. 479, 513, 564
RCTs (randomised controlled trials) 523–4
re-experiencing in PTSD 488
reaction formation 11, 12
reaction time measurement 545
reading
  automaticity 229
  development 278–81
  literacy 278–81
  materials for essays 624
  out loud 213–14
  words 213–16, 229
realistic conflict theory 374–5
reality television 607
Reason, J. 180
reasoning 218–33
  deductive 227–8
  inductive 222–7
Reavey, P. 311
recall 189, 191, 193–4, 202
recency effect 187–8, 208, 348–9
reception paradigm 224
receptive fields 138
receptor proteins 65
receptors 65, 85, 88–9
recessive genes 242, 244
recessive traits 62
reciprocal determinism 422
reciprocal inhibition 513
recognition
  apperceptive agnosia 2
  by components 163–4
  object recognition 162–5
  pattern recognition 157–62
  word recognition 164–6, 213–16, 229
red nucleus 80
reduction mnemonics 192
reductionism
  determinism 48
  levels of explanation 44–6
  medical model 467
  physiological approach 15
  psychobiology 54–7
  psychopathology model 467
  types 44
Ree, M.J. 456
Reed, E. 157
re-experiencing in PTSD 488
Reeves, Vic 56
reference groups 363
referencing skills 624–5, 627
referent informational influence 365
reflected appraisal 406–7
reflective practice 614, 617–21
reflector learning style 620–1
reflexes 101–2
reflexive discourse 5
reflexive self 406
reformist delusions 470
regression 565, 593
regression line 581
regulation of psychology 610
rehearsal 189, 405
Reicher, G.M. 165
Reicher, S. 409
reification 28
reinforcement 106–9, 117, 119, 518
reinforcement-affect model 353
reinforcement sensitivity theory 428
relapse 120
related ANOVA 596–7
related *t*-test 594
relational self 403
relationships
  controls in RCTs 523–4
  perceived equity/inequity 355
  of variables 581–2, 591–3
relative refractory period 82
relaxation techniques 513, 515
relevance of study 614–15
reliability 457, 458, 545
REM (rapid eye movement) sleep 132, 133
reminiscence bump 196
remissions 523
renin 123, 393
repeated measures design 559, 560–1
  ANOVAs 597
  t-tests 594
repetitive behaviours 295, 296
repisodes 198
replication of DNA 65
report conditions 185
reports
  data reporting 578–81
  writing reports 612, 625, 627
representational redescription (RR) model 263

representations
  cognitive development 255, 262–4
  of knowledge 198–202
  pretend play in child development 294
representativeness heuristic 226, 304
repression 11, 194, 196
reproductive ducts 97
reproductive strategies 219
Reschly, D.J. 456, 459
research careers 603, 604, 607, 609
research methods 539–601
  clinical psychology 487
  cognitive psychology 14
  data collection 553–67
  developmental psychology 245–7
  ethical considerations 29, 553–6
  health psychology 531
  intelligence 442, 446–7
  measurement 543–6
  necessity of 540–52
  personality 413–17, 420–32
  report-writing 625
  sample use 586–601
  social psychology 309–11, 319, 322
  summarising data 568–85
  theory links 540–1
  understanding process 542
  see also methodology
researcher bias 206
reserpine 92
Resick, P.A. 489
residual schizophrenia 496–7
resilience 239
response amplitude 102
response latency 103
response probability 102–3
response selection model 172–3
response shaping 517–18
response time 214–15
responses 9, 48
  see also classical conditioning; operant conditioning
responsibility 339, 486, 488
resting potential 81
restoration effect 165
restructuring problems 219
results section of reports 627
RET (Rational-Emotive Therapy) 519
retention function 196
reticular formation 80, 132
retina 136–8
retinal disparity 155, 156
retinal ganglion cells 138, 139
retinal size 152–3, 157
retrieval 189, 191, 193–4, 202
retrieval cues 193–4, 195, 198
retrieval schemata 616
retroactive interference 194–5
retrograde amnesia 183
retrograde signalling 91
retrospective questionnaire studies 487
retrospective withdrawal from research 555
reuptake 90, 94
reversibility operations 255–6, 262
review papers 578
revision skills 612, 628–30
reward mechanisms 115–24, 130
reward pathways 116–17
Rheaume, J. 488
rhetorical actions 311
Rhodes, W.S. 341
rhodopsin 137
ribosomes 66
Richards, G. 5, 12, 28
Rickabaugh, C.A. 154
Riddoch, J.M. 159
Ridley, A.M. 198
Riggs, D.S. 490
right brain 78
right to privacy 312
Rimm-Kaufman, S. 382
Ringelman, Max 367–8
Ringelman effect 367–8
risk of harm 554, 556
risky-shift phenomena 368
Ritalin 94, 133
Rivers, W.H.R. 8
road rage 358–9
Robbins, S. 448
Roberts, D.C.S. 117
Robins, L.N. 502
Robinson, J.A. 196
Robinson, L.A. 523
Robinson, T.E. 120
Rock, I. 165
rods 136, 138, 139
Roemer, L. 485
Rogers, Carl 8, 12, 414, 416, 512
Rogoff, B. 265
Rohrer, D. 615
Roid, G.H. 461
role schemata 306
roles, acquiring 404
Rolls, E.T. 130
Ronan, K.R. 399
Rorschach tests 456
Rorty, M. 504
Rosch, Eleanor 200–1
Rose, Steven 44, 45
Rosenberg, S. 348
Rosenfarb, I.S. 500
Rosenhan, D.L. 564
Rosenstock, I.M. 529
Rosenteil, A. 537
Rosenthal, R. 26, 562–3, 599
Ross, L. 303, 341, 342
Rotter, Julian B. 417, 527
Rousseau, Jean-Jacques 236
Rowe, D.C. 430
Royal College of Psychiatrists 510
RR (representational redescription) model 263
Rubin, D.C. 196
Rubin, Z. 354–5
Rudestam, K.E. 399
rule-based processes 180
rules
  of attraction 60
  children's games 258–9
  linguistic 271, 272, 274–5
  of logic 228
  moral judgement development 257–9
Rumelhart, D.E. 166
Rushton, J.P. 36, 37, 444
Rutter, M. 297

saccule 146
Sachs, J. 208–9
SAD (seasonal affective disorder) 490
sadness 380–1
Sahgal, A. 55
St Charles, N.D. 395
salaries
  clinical psychologists 605
  counselling psychologists 605
  neuropsychologists 607
  occupational psychologists 608
  sport/exercise psychologists 609
  teaching/research careers 609
salivation 102
Salkovskis, P.M. 423, 482, 488
Salomon, G. 442
salt 146
Salthouse, T.A. 447
salutatory conduction 83
SAM (situationallly accessible memory) 490
samples/sampling 565–6
  bias reduction 39
  definition 565
  experimental research 558, 560
  generalisation 38
  median 571
  size calculation 590
  use of 586–601
  validity 25
sampling distribution 586
sampling error 586, 587
sampling variation 572, 586–7
sanctity 28
Sanders, B. 445
Sanders, G. 78, 96
Sanderson, W.C. 482
Sands, S.H. 524
satellite cells 74–5
satiety 394
satisfactory doctor consultations 532
savant syndrome 444
Saxe, Leonard 386
scaffolding 265
Scarborough, H.S. 208
scatterplots 581–2
scene schemata 201
Schachter, D.L. 126–7, 194
Schachter–Singer theory of emotion 387
Schactel, E. 196
Schaffer, H.R. 288
Schaie, K.W. 246, 447
Schank, R.C. 201
schedules of reinforcement 108–9, 117
Scheff, T.J. 468
Scheier, M.F. 527
schemata 192, 194, 200–2
  cognitive development 251
  cognitive therapy 519
  expertise 230
  retrieval 616
  social psychology 304–5
Schifter, D.E. 530
Schildkraut, J.J. 491
schizophrenia 496–501
  aetiology 497
  amphetamines 92
  animal models 58
  attribution processes 499
  biological explanations 497–8
  categories 496
  diagnosis 497

  dopamine 90
  drug treatment 509
  DSM-IV-TR 473–4
  expressed emotion 499–500
  genetics 49, 68
  inherited predisposition 497
  paranoia 499
  physiological reductionism 44
  psychological explanations 498–9
  reserpine 92
  Soviet Union dissidents 470–1
  symptoms 496–7
schizophrenogenic mothers 498
Schmidt, R.A. 229
Schneider, F. 497
Schneider, W. 170
school children 255–6, 257, 290–2
schools, careers in 609
Schulkin, J. 352, 387
Schvaneveldt, R.W. 200, 215
Schwab, R. 429
Schwartz, N. 318, 322
Schwartzman, A.E. 447
science/scientific method 20–31, 45
  aims 21–2
  alternatives 29–30
  assumptions 21
  development 21
  evaluation 24–5
  hierarchy 45
  improving 39–40
  intelligence studies 439
Scientific Procedures Act 1986 58
scientific racism 35–7
scientific statement definition 541–2
Scotland, careers in 605
Scott, S. 531
scrambled sentence techniques 351
screening tests 58
scripts 201, 202
SD (discriminative stimuli) 103, 109
Sdorow, L.M. 154
SDT (signal detection theory) 170
seasonal affective disorder (SAD) 490
second messengers 89, 95
secondary appraisal of stress 533
secure infants 289, 290
security of attachment 288–9, 290
Sedikides, C. 403, 408
Segal, E.M. 415
Segal, S.J. 178, 179
Seidenberg, M.S. 206
Seizisman paralysis 471
selection paradigm 224
selective attention 170–4
selective breeding 60
selective serotonin reuptake inhibitors (SSRIs)
    94, 492, 509–10
the self 403–11
  definition 403
  development of 397, 404–5
  factors contributing to 406–7
  functions 403–5
  humanism 12
  universals 32–3
self-administration of drugs 116, 117, 118
self-categorisation process 365
self-concept 284–300, 350, 404, 407
self-control therapies 517–19
self-deception 459–60
self-development 397, 404–5
self-efficacy 395–6, 422
self-enhancement strategies 342, 408
self-enhancing bias 342
self-esteem 316–17, 350, 405, 407–8
self-handicapping hurdles 408
self-harm 495, 515, 516
  see also parasuicide
self-help groups 520
self-injurious behaviour 494–6, 515, 516
self-knowledge 511–12
self-perception 12, 319, 325–6, 405, 407–8
self-presentation 405
self-protective bias 342
self-relevant information 407–8
self-report methods 388, 456, 544, 545
self-schemata 306, 405–6
self-serving bias 341, 342, 408
Selfridge, O.G. 157
Seligman, M.E.P. 472, 493, 524
semantic differential scales 319, 320
semantic encoding 187
semantic memory 184, 198–202
semantic priming 200, 215
semanticity 204, 206–7
semi-partial correlation 592, 593
semicircular canals 146
seminars 623
sensation-seeking (SS) 67, 68, 399, 428–9
sensations 151
sensitisation 119–20
sensitivity (perceptual) 170
sensorimotor stage of development 251
sensory memories 173, 183–9
sensory systems 74, 136–49, 151
sensory thresholds 151
sentence comprehension 207–9
separation effects 288, 289, 291
septum 79
sequential research design studies 246
serial comparisons 160
serial position effect 187, 189
serotonin 15, 84
  depression 15, 491–2
  eating behaviour 121–2
  eating disorders 504
  major depression 491–2
  MDMA effects 94
  metabolism 86
  receptors 88
  sleep 132
  synthesis 86
severity factors, health belief models 529
sex chromosomes 63, 97
sex differences 78, 96–8, 286, 429
sexual development 11, 418–19
sexual differentiation 97–8
  see also sex differences
sexual motivation 398–9
sexual orientation 8, 39, 98
shadowing 170–3, 177, 212
Shah, A. 296
Shallice, T. 79, 112, 214
shallow processing 190, 191
shape constancy 152
shape of distributions 575–6
shaping process 109
shared environment effects 243, 244–5
shattered assumptions 488–9
Sheldon, William 417
Sher, K.J. 486
Sherif, Mustafa 364, 365, 374–5
Sherman, M.F. 533
Shewan, David 609
Shiffrin, R.M. 189–90
shifting covert attention 173–5
Shisslak, C.M. 503
Shoebridge, P. 504
short-term memory (STM) 184–9
  capacity 185, 186
  duration 185–7
  encoding 187
  LTM distinction 185–9, 192
  models 189–91
  reading/vocabulary development 280
shyness 413
sibling influences 235, 243, 245
side effects of treatments 509, 510
Siegel, L.E. 280
Siegler, R.S. 260–2
sign language 206, 269, 273, 275
signal detection theory (SDT) 170
significance
  interactions 598
  statistical 588–9
Silbereisen, R. 297
Silva, R.R. 488
similarity
  control group participants 558–9
  personality 412–13
  principle of 152, 153
  single vs multiple resources 178
Simmel, M. 335
Simon, H.A. 8, 192, 221–2, 230
Simon, Theodore 237, 440
simple cells 140, 162
simple study material 615
Simpson, D.D. 396
simulations 58, 294
Sinclair family case study 521
sine waves 141, 142
Singer, J.E. 126–7, 387
Singh, D. 60
single process account 366
single resource theory 177–9
single subject designs 563–4
situational causes 334
situational perspectives 373–4, 387
situational phobias 480
situationally accessible memory (SAM) 490
sixteen-trait theory 425
size
  brain 446
  of effect 39, 590
  groups 367–8
  object size 153
  retinal 152–3, 157
size constancy 152–3
size–distance invariance hypothesis 152
skewed distributions 568–9, 570–2
skilled processes 180
skills
  acquisition 177, 228–9
  career skills 603, 610
  study skills 612–32
skin 145
Skinner boxes 105–6, 110

Skinner, Burrhus F. 8, 10, 100, 105–6, 237, 272, 417
skull 72, 74
Slade, P. 515
Slanger, E. 399
Slater, A.M. 253
sleep 125–35
  brain mechanisms 132
  deprivation 133–4
  stages 131–2
sleep paralysis 133
sleep spindles 131, 133
sleeping pills 132
SLI (specific language impairment) 280
Slobodian, P.J. 399
slow-wave sleep 131
SMA (supplementary motor area) 147
small-group study 612, 622–3
Smart, J.L. 448
Smith, E.E. 200
Smith, E.R. 340
Smith, K.A. 409
Smith, M.B. 317
Smith, M.I. 524
Smith, P.B. 372
Smith, R.E. 194
smoking
  drug discrimination 110
  foetus effects 240
  giving up 118–19
  hypnotherapy treatment 522
  nicotine effects 67, 94, 118–19
snowball sampling 566
SNS (somatic nervous system) 71
Snyder, M. 330, 350
Social Attitude Inventory 28
social cognition 303
social comparisons 369, 404, 408–9
social compensation 367–8
social constructionism 15–17, 307
  attitudes 17
  evaluation 15–16
  handshakes 9
  key features 15
  new paradigm research 29
social control 10
social Darwinism 6
social desirability 459–60
social development 284–300
  adolescence 297–8
  attachment 287–90, 291, 300
  autism 295–6
  bullying 290–2
  identity 284–7
  pro-social behaviour 290
  self 284–7
  theory of mind 292–5
social distance 353
social environment effects 422–3
social exchange theory 353
social experience deprivation 238
social facilitation 303, 367
social goals 396
social identity theory 317, 365, 375, 404, 406, 409–10
social impact theory 366
social influence 362–78
social inhibition 367
social interaction 345, 350–5
  aggression 357–9
  behaviour 350–5
  cognitive development 257–9, 264–6
  language acquisition 270–1, 275–8
  moral judgements 257–9
  nonverbal communication 350–3
  pro-social behaviour 355–7
  scrambled sentence techniques 351
  subliminal priming techniques 351
  theory of mind development 294
social learning theory 10, 287, 359, 422, 423
social loafing 367
social neuroscience 57
social norms 409, 470–1
social psychology 301–78
  archival research 310
  attitudes 315–30
  attribution 333–44
  categorisation 304–5
  debriefing 313
  deception 313
  definitions 302
  discourse analysis 310–11
  emotions 126–7, 381
  ethics 311–12
  experimental methods 309–10
  field studies 310
  free will 48
  group processes 362–78
  historical issues 303
  hunger 394
  impression formation 345–61
  informed consent 313
  issues 302–14
  non-experimental methods 310
  paradigms 303–5
  persuasion 315, 326–8, 330
  prison study 312
  research methods 309–11, 319, 322
  schema 304–5
  stereotyping 305–7
  survey research 310
  themes 302–14
Social Readjustment Rating Scale (SRRS) 534–5
social reality hypothesis 365
social schema 304–6
social self 403
social support treatments 523
social workers 469
socialisation 406
socially-constructed intelligence 437
sociobiology 44
socio-cultural influences 264–6
socio-economic factors 238–9
Socrates 439
Socratic dialogue method 619
sodium 81, 137
sodium–potassium pump 81
soft determinism 47
soldiers' sleep deprivation 134
Soloman, Z. 488
Soloman four-group design 560, 561
Solso, R.L. 160, 218
somatic nervous system (SNS) 71
somatic theory of emotions 382–5, 387
somatogenic hypothesis 466
somatosensation 144–6
somatosensory cortex 145, 146
Sonnekus, I.P. 421
sound *see* auditory...; phonological...
sour tastes 146
source traits 425
southern blots 68
Soviet Union dissidents 470–1
Spanish vocabulary test 186
spatial abilities 78
spatial frequency 141, 142
spatial intelligence 443
spatial summation 82
Spearman, Charles 8, 438, 440–1, 592
Spearman's ρ 592
specialised skills 441
specific language impairment (SLI) 280
specific phobias 478–80
  aetiology 479
  common phobias 479
  evolutionary accounts 479
  multiple pathways 479–80
  phobic beliefs 478–9
speech processing 212, 268–71, 274–8, 311
speed of processing problems 280–1
speed tests 456
Spelke, E. 176, 254
spellchecking essays 624
Spelman, M.S. 532
Spelt, J. 504
Spencer, Herbert 6–7
Sperling, George 173, 184–5
spinal canal 72
split-half reliability 545
spoken word recognition 212, 268–70, 311
spontaneous attributions 340
spontaneous behaviour 10
spontaneous recovery 103, 108, 120
spontaneous remission 523
spontaneous use of language 206
spoonerisms 211–12
sport psychology careers 604, 608–9
sporting performance 179, 393–4, 396
spotlight analogy 173–4
spreading activation model 199
Springer, L. 623
squared deviations 575–7
Srivastava, S. 427
SRRS (Social Readjustment Rating Scale) 534–5
SS (sensation-seeking) 67, 68, 399, 428–9
SSRIs (selective serotonin reuptake inhibitors) 94, 492, 509–10
stability 395, 426, 427
stage-setting for self-presentation 405
stages of development
  attachment 288
  cognitive development 252, 253, 255–6
  identity development 285
  psychoanalysis 511
  reading ability 279
  self development 285
  versus levels concept 263
Stainton Rogers, W. 16, 363, 403
standard deviation 575–8
  APA conventions 579
  psychometric testing 454, 455
  sampling variation 586–7
standard error 578, 579, 586–7
standardised psychometric tests 453–4,

  457–8
Stanford–Binet test 8, 459
Stanford prison experiment 29
Stanley Hall, G. 237
Stanovich, K.E. 215, 280
stapes 143
Starfield, B. 532
state-dependent memory 194
statistical models 591–8
statistical power 590
statistical significance 588–9
statistics 539–601
  accuracy 586–8
  causal inferences 565
  data collection 553–67
  difference models 593–8
  graphing 583–4
  relationships of variables 591–3
  reporting 579
  sample use 586–601
  summarising data 568–85
  theory-testing 548–9
statutory regulation of psychology 610
Steele, C. 445
Stein, M.B. 430
Steinberg, L. 445
Steinhausen, H.C. 503
Steketee, G. 486, 515
stem cell research 75
Stenberg, R.J. 220
stereotyping 305–7, 308–9
Sterling, Christopher 150–233
Sternberg, Robert J. 156, 169, 355
  intelligence 437–8, 444–5, 448
  study skills 620, 630
steroid hormones 95, 96
Stice, E. 505
stigmatisation 468
stimulative factors 49, 518
stimuli 9
  see also classical conditioning; operant conditioning
stimulus control 518
stimulus discrimination 103
stimulus-driven percepts 165–6
stimulus generalisation 103
STM *see* short-term memory
STN (subthalamic nucleus) 85
Stoddard, George 438
Stokes, T.F. 517
Stolerman, I.P. 110
Stone, A. 619
Stoner, J.A.F. 368
stooges 127
Stopeck, M.H. 349
'storm and stress ' of adolescence 297–8
Storms, M.D. 342
story grammars 202
strange situation experiments 288–9
strategic control
  covert attention 174
  divided attention 175
Strauss, M.A. 359
strengths, study skills 614, 619–20, 630
stress 526, 533–6
  adolescence 297–8
  brain mechanisms 130–1
  coping mechanisms 382
  foetus effects 240–1
  physical factors 532
  post-traumatic 488–90
  professional achievement 399
  transactional models 533
stressors definition 533
Striegel-Moore, R. 504
Stroop effect 177, 229
structural dependency of language 205, 272
structuralism 7
structure of intellect model 441
Stuart, R.B. 518
student-centred learning 613, 619
student representative role 631
student samples 25, 32
study skills 612–32
  accessing resources 631
  applying 620–31
  behavioural self-control 518
  definition 612–13
  key principles 613–20
Stumpf, H. 445
subarachnoid space 72
subfornical organ 123
subgoals 222
subjective judgements 225
subjective validation effect 407
subliminal priming techniques 351
subordinate constructs 422
substance misuse 115–20
  see also drugs
substantia nigra 80
subthalamic nucleus (STN) 85
success criteria for treatments 522
success motivation 399
successful intelligence concept 630
successive approximations 109
sufficiency principle 329
suffocation alarm theories 481
suicide 494–6, 503
sulci 76
sum of squares 575
summarising data 568–85
sunk cost effect 226–7
superego 10–11, 511
superheroes 62
superior colliculi 80
superior olivary nuclei 144
superordinate constructs 422
superordinate goals 375
supplementary motor area (SMA) 147
suppression condition 308
suppression of stereotypes 308–9
Sure Start programme 240
surface approach to learning 619, 628
surface traits 425
surprise 380–1
survey research 310, 487
survival of the fittest 60
susceptibility perception 529
Sutton, Jon 603–11
Svanborg, P. 431
Swindle, R.W. 533
symbolic representations 255, 262
sympathetic nervous system 71, 73
symptoms
  animal models 59
  positive/negative 90, 497
  schizophrenia 496–7
  withdrawal symptoms 119
synapses 74
synaptic regulation 89–90
synaptic transmission 83–90, 112–13
synaptogenesis 75
syndrome definition 474
syntactic planning 211
syntax 207, 271
syphilis 466
systematic desensitisation 513, 515
systematic sampling 565–6
systematic tests 256, 453
systematic variations 558, 588
systems theory 180, 520

t-distributions 593–4
t-statistics 593
t-tests 593–4, 597
Tagiuri, R. 347
Tajfel, Henri 303, 375–6, 406
talents definition 444
talking 311
  see also speech processing
target detection 172–3
target words 210
Tashakkori, A. 408
task difficulty, memory models 189
task-involved goals 396
taste buds 146
TAT (thematic apperception test) 456, 457
Tate, P. 531
Tavris, C. 34
taxi drivers 80
Taylor, S.E. 342, 533
Taylor, Shelley T. 303, 304–5, 307
'tea test' (Fisher's) 548, 549
teachers' expectations study 562–3, 599
teaching careers 603, 604, 609
teamworking skills 618
tectoral membrane 143
tectum 80
tegmentum 80
telencephalon 76–80
television
  psychologists on 607
  violence on 432
temperament assessment 288
template matching 157–60, 166
temporal lobe 77
temporal summation 82
teratogens 239–41
Terman, Lewis Madison 438
tertium quid problem 547
test–retest reliability 458, 545
test statistics 588–90, 595
testosterone 97–8, 130, 429
tests
  Army alpha/beta tests 35
  assumptions 591, 594, 597
  child development 237
  choosing 599–600
  definition 453–4
  differences 593–8
  digit span tests 186, 188, 616
  embedded figures test 295, 296
  hypothesis-testing 10, 223–5
  intelligence 8, 28, 35, 237, 440, 455–6, 459
  power 456, 590

  reliability 457, 458, 545
  sampling 565–6
  screening tests 58
  standardisation 457–8
  systematic tests 256, 453
  theory-testing 541–3, 548–51
  two-tailed tests 589
  validity 457, 458–9, 460
  vocabulary tests 186, 190, 280
  see also psychometric testing
texture gradient 156, 157, 166
thalamus 76, 85, 127, 144, 146
Thatcher, Margaret 133
thematic apperception test (TAT) 456, 457
theoretical definition of extroversion 23–4
theories
  analysis driven by 550
  creating 542
  definition 540
  guide maps 629
  hypotheses exercise 546
  methodological bias 37
  modifying 542
  research links 540–1
  scientific method 22
  testing 541–3, 548–51
theorist learning style 620–1
theory of mind (TOM)
  autism 295, 296
  child development 292–5
  false belief tasks 293, 294, 295
theory of planned behaviour (TPB) 322–3, 530
theory of reasoned action (TRA) 322, 323
therapies *see* treatments
therapist–client relationship 512
theta activity 131–2
'things not working properly' assumption 467
thinking 218–33
  cognitive development 250–67
  problem solving 218–22, 227
thirst 122–3, 393
Thoresen, C.E. 517
Thorndike, Edward L. 8, 105, 219, 439
Thorndike, R.L. 459
Thrasher, T.N. 123
three-dimensional perception 155, 163–4, 582
three mountain problem 255, 256
three-stage model of attribution 340
three-trait theory 424
thresholds, logogen 215
Thurstone, L.L. 441
Thurstone scale 320
time management skills 615, 618, 630
time-series designs 597
tip of the tongue (ToT) phenomenon 210, 211
title of reports 625
Todaro, J.F. 382
token economy schemes 515–17
tolerance 104
Tolin, D.F. 486
Tolman, Edward C. 110–11, 394
TOM (theory of mind) 292–5
Tomasello, M. 270, 277
tongue functions 146
top-down processes 165–6
ToT (tip of the tongue) phenomenon 210–11
total time hypothesis 615
touch 145–6
TPB (theory of planned behaviour) 322–3, 530
TRA (theory of reasoned action) 322, 323
Trabasso, T. 224
trace decay 187, 194
tracking tasks 175, 176
training courses 610
  clinical psychology 604–5
  counselling psychology 605
  educational psychology 605
  neuropsychology 607
  sport/exercise psychology 608
  teaching/research careers 609
trait reversal experiments 349
trait theory 372, 415–16, 424–6
traits 61–2, 424
transactional models of stress 533
transcription of DNA 66, 67
transfer ribonucleic acid (tRNA) 66
transference technique 511
transgenic mice 68
transmitter molecules 65
transpersonal therapy 512
transvestism 398
Trapp, Annie 612–32
trauma 488–90
treatments
  drug treatments 119, 508–10, 535
  effectiveness assessment 522–4
  pain 535
  psychopathology 508–25
  side effects 509, 510
  success criteria 522
Treisman's attenuation model 172
Trevarthen, C. 285
triadic relationships 293
trial and error strategies 219
Triandis, H.C. 429
triangular model of love 355, 356
triarchic theory of intelligence 444–5
tricyclic antidepressants 492, 509
Triplett, Norman 303
tRNA (transfer ribonucleic acid) 66
Troop, N.A. 504
Tufte, E.R. 581–4
Tulving, Endel 184, 191, 193–4, 195–6
Turk, D.C. 537
Turner, J.A. 537
Turner, J.C. 365, 369, 375–6, 406
tutorials 623
Tversky, A. 225–6, 304
Twemlow, S.W. 397–8
twin studies
  developmental influences 243, 245
  heredity/environment debate 49, 66
  intelligence research 442, 446–7
  language acquisition 270
  personality research 430
two-condition group design 560–1
two-factor theory
  emotions 387
  intelligence 440–1
two-tailed hypotheses 543
two-tailed tests 589
two-way independent ANOVA 597
two-way mixed ANOVA 597–8
two-way repeated measures ANOVA 597
tympanic membrane 143
Type I errors 589
Type II errors 589–90
typicality effect 199, 200

u-shaped learning curves 263
UCR (unconditioned response) 102–4
UCS (unconditioned stimulus) 102–4, 479
ultimate attribution error 341
unattended messages 171–3
uncertainty 485
unconditional positive regard 512
unconditioned response (UCR) 102–4
unconditioned stimulus (UCS) 102–4, 479
unconscious processes 10, 415–20, 511
unconstrained behaviour 47
understanding
  scientific 22
  skills of 614–16, 623–4
  therapy based on 523
Underwood, B.J. 194
undifferentiated schizophrenia 496–7
unilateral visual neglect 174, 175–6
unipolar depression 491–4
universal grammar 272, 277
universals 32–3, 272, 277, 442–5
university lecturing 609
unresolved adults 290
unstructured attention 523
unsystematic variations 558, 588
upper quartile 573–4, 580
Urdan, T. 396
Ustan, T.B. 494
utilitarian function of attitudes 317
utricle 146

vagus nerve 121
Valentine, E.R. 47
validity 545
  animal research 57, 58–9
  experimental research 23, 547
  external 25, 44
  internal 25, 44, 523–4
  observational methods 563
  projective tests 457
  psychological theories 43
  psychometric tests 457, 458–9, 460
  treatment efficacy 523–4
Valins, S. 385
Valium 91, 132
values
  motivation 394–5, 397
  person variables 422
  research 32
  scientific method 39–40
VAM (verbally accessible memory) 490
van den Hout, M. 486
Van Houdenhove, B. 533
Vanfurth, E.F. 504
variability 573, 575
  see also variance; variations
variable interval (VI) schedules 109
variable ratio (VR) schedules 108
variables 540
  cross-sectional design 561
  difference models 593–8
  graphing 581–2
  manipulating 546, 558–9, 595
  measuring 543–5
  partial correlation 592

  regression 593
  relationships 581–2, 591–3
  report-writing 625
  statistical models 591–3
  types 547–8
variance 574–5, 591
  see also variability
variations 572, 586, 588
vascular theory of emotional feedback 384
Vasey, M. 483
vasopressin 123
Vasterling, J.J. 488
Vaughan, G.M. 302, 363–4, 369
ventral tegmental area (VTA) 116, 117, 118
ventromedial hypothalamus (VMH) 120–1
verb island hypothesis 277
verbal memory 184, 186, 490
verbally accessible memory (VAM) 490
verbatim memory 208
Verbrugge, L.M. 531
Vernon, Philip A. 441, 443
Verrier, R.L. 381
vertical axis 569, 582, 583
vesicles 84
vestibular system 146–7
VI (variable interval) schedules 109
vigilance 169–70
violence
  determinism 46
  hot weather 385
  personality 432
  reductionism 46
vision 133, 136–42, 151–68, 178–9, 281
visual attention 173–4
visual cortex 140
visual illusions 154–5
visual object agnosia 157, 159
visual perception 151–68, 178–9
  see also vision
visual route to reading 213
visual search experiments 160, 163
visual sensory memory 173, 184–5
visual word recognition 164, 166
visuospatial scratchpad 190
Vlaeyens, J. 537
VMH (ventromedial hypothalamus) 120–1
vocabulary tests 186, 190, 280
vocalising language 268–9
  see also speech processing
Voegtlin, W.L. 515
voluntary behaviour 47
volunteer sampling 566
Von Wright, J.M. 173, 185
Voyer, D. 445
VR (variable ratio) schedules 108
VTA (ventral tegmental area) 116, 117, 118
vulnerability 497
Vygotsky, Lev S. 238, 264–5, 619

Wacker, D.P. 515
Wagenaar, W.A. 196, 198
Wahlsten, D. 446
waist-to-hip ratio (WHR) 60
Wakefield, J.C. 472
Wakeling, A. 503
Walker, H. 481, 517
Walker, I. 307
Wall, P.D. 146, 536–7
Wallace, Glenda 604
Wallace, Marjorie 468
Wallach, M.A. 368
Waller, G. 504
Wallerstein, Judith 420
Wallston, B.S. 527
Wallston, K.A. 527, 528, 531
war in Iraq 316
Warren, R.M. and R.P. 165
Warrington, E.K. 214
Wason, P.S. 224
water loss 393
water maze 111
Watkins, C.E. Jr 456, 459
Watson, James 45
Watson, John B. 8, 9, 315, 479, 513, 564
Watson, J.S. 285
Wayland, S.C. 212
Wearing, Clive 183, 184
Weaver, J.B. 432
Web of Knowledge database 631
Webb, K. 468
Weber, E.U. 226
website resources 631
Webster-Stratton, Carolyn 239
Wechsler, D. 438, 455–6, 459
Wechsler intelligence scales 455–6, 459
Weikert, D. 240
Weinberger, M. 533
Weiner, B. 338–9, 395, 399
Weiss, R.L. 513
well-defined problems 218
Wellman, H.M. 294
Wells, Adrian 197, 485, 520
Wenmoth, D.B. 78, 96
Wernike's area 78
Wertheimer, Max 8, 152
West, R.F. 215
Westen, D. 524
Wetherell, Margaret 310, 311, 368
Wetherick, N.E. 218
Whaley, C.P. 214
Wheeler, D. 165
White, R. 373
Whitley, G. 489
WHO (World Health Organization) 473, 526–7
whole report condition 185
WHR (waist-to-hip ratio) 60
Wickens, C.D. 175–7, 178
Wickens, T.D. 170
Wickersham, D. 530
Widiger, T.A. 501
Wiesel, Torsten 141, 160, 162–3
wiki websites 631
Wilcox, T. 253
Wilcoxon signed-rank test 594–5, 597
Wilkinson, Sue 15
Willerman, L. 446
Williams, Robert L. 461
Williams syndrome 273
Willner, P. 58–9
Wills, T.A. 532
Wilson, Barbara 184, 607
Wilson, E.J. 484
Wilson, G.T. 513, 515
Wilson, J. 173
Wilson, M. 420, 456, 459
Wilson, R. 339
Wimmer, H. 293
Winston, P.H. 152
Wise, R.A. 120
Wishart, J.G. 252
witchcraft 466
withdrawal from research 554–5
withdrawal symptoms 119
within-subjects design 559
  see also repeated measures design
Witte, K. 330
WM (working memory) 179, 190, 624
Wolf, S. 366
Wolffian system 97
Wolpe, J. 513
women survivors of abuse 311
Wood, D.J. 265
Wood, W. 323
Woodhead, M.M. 612
Woods, Tiger 179
Woolverton, W.L. 117
word frequency effects 213–15
word lists
  central/peripheral traits 346
  trait reversal experiments 349
word order 207–8, 211
word recognition 164, 165–6
  lexicalisation 210–11
  peripheral traits 346
  sentence comprehension 207–9
  speech perception 212
  written language 213–16, 229
word superiority effect 164, 165
work/workplace
  intelligence 448
  learning environments 620
  motivation research 391
working memory (WM) 179, 190, 624
World Health Organization (WHO) 473, 526–7
'worried well' category 530
worry 483–5
Wortman, C.B. 493
wrap-up 208–9
written language 213–16, 229
  active learning 617
  reflective checklist 618
  reports 578–81
  study skills 612, 617–18, 623–5, 627
Wundt, Wilhelm 5, 6, 7, 439

X-axis 569
Y-axis 569, 582, 583
Yager, J. 504
Yerkes, Robert 35
Young, A.W. 161
Yuille, - 198
Yukl, G. 372

z-scores 576–8
Zacks, R.T. 192
Zajonc, R.B. 318, 353–4, 367, 384, 388
Zeki, S. 130
Zillmann, D. 359, 385
Zimbardo, Philip 29, 311–12, 316
zone of proximal development (ZPD) 265
zoom lens analogy 174
ZPD (zone of proximal development) 265
Zuckerman, M. 399, 428–9, 445
Zvolensky, M.J. 481
Zyban treatment 119
zygote 63